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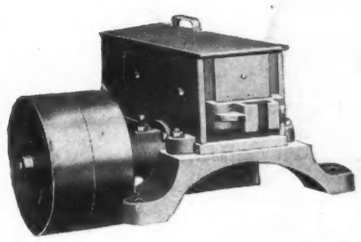

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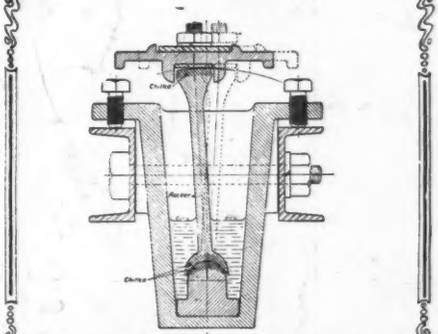

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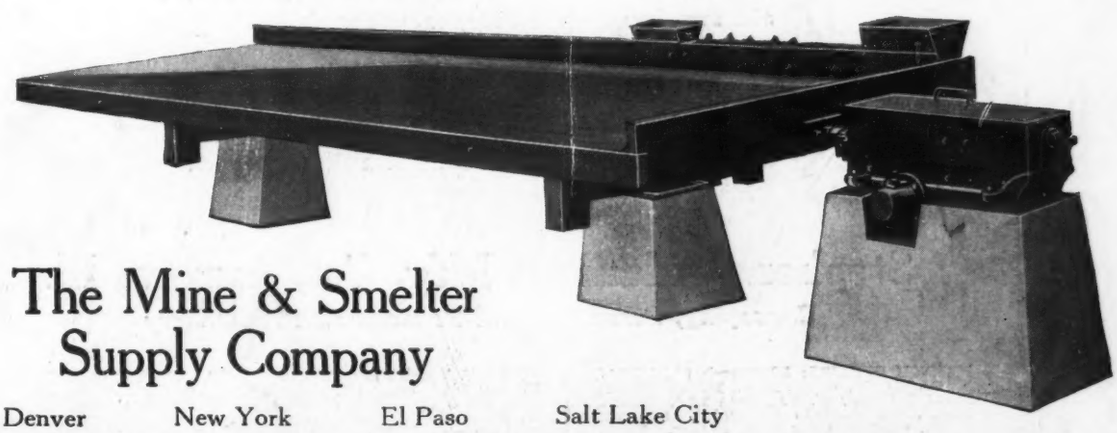

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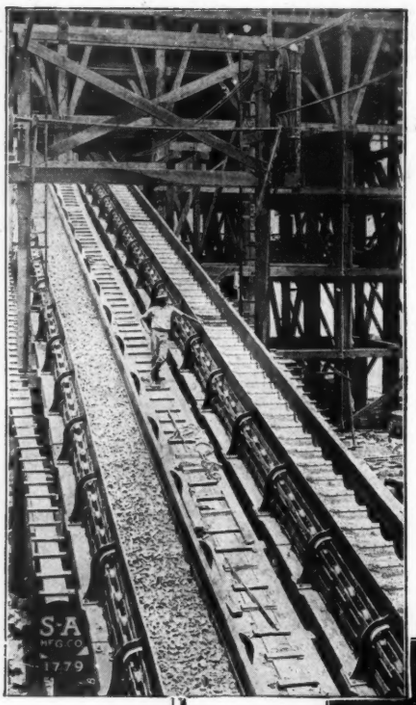

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A SCENE ON THE CHILEAN NITRATE PAMPA—A POTENTIAL SOURCE OF SALTPETER AND AN ACTUAL SOURCE OF A PRODUCT WHICH IS LARGELY USED IN ITS MANUFACTURE

Production and Uses of Saltpeter

BY HOYT S. GALE*

A comprehensive study of the history, uses, and sources of potash saltpeter, and notes as to its availability for more extensive application as a fertilizer. Reference is made to the important method recently adopted in Chile for isolating a comparatively high-grade potassium nitrate from the mother liquor which circulates in the Chilean nitrate plants. Data are given indicating the prevailing methods of pricing nitrate products on the basis of the units of nitrogen content.

SALTPETER, otherwise known as nitrate of potassium, was first recognized because of its difference from common salt and its usefulness for various purposes. Its value as a fertilizer seems to have been known for a considerable time, and as the principal ingredient of gunpowder its importance in warfare dates from about the sixteenth century. Only in late years—since the American Civil War—has black powder made from saltpeter been superseded largely by modern explosives in the composition of which the potassium salt does not enter. The supply of nitrates has been discussed as one of vital importance to the nations engaged in the Great War, and it is not strange that attention should be directed to saltpeter because of its former use as the nitrate salt in the making of gunpowder.

Interesting data on the subject of saltpeter are to be found among old publications. One volume published in London in 1670, dedicated to "The Right Honorable Sir Thomas Chicheley, Knight, Master General of His Majesties Ordnance," purports to be a complete review of what was then known of the nature and uses of saltpeter, or niter, as it was then termed. According to this account: "The place famous for nitre among the Ancients was chiefly Egypt, where were the Nitrariæ or nitre-works. But now East-India . . . . are the chief places, in many parts of which countries it is artificially extracted and transported to us."

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Saltpeter is produced in earth when animal and vegetable matters containing nitrogen decay in the presence of lime or wood ashes or some substance that renders the soils alkaline, and especially in warm, moist climates. Earths rich in saltpeter have been worked in many countries, and various accounts are found of the production from this source in Egypt, India, Turkey, Burma, Tibet, Turkistan, Sumatra, Italy, Ceylon, Hungary, Poland, Spain, Brazil, on the seacoast of Peru, and in various parts of Central America and Mexico. In countries of more temperate climate, saltpeter has been produced in times of emergency from the earths of caves, cellars, and other protected places where it naturally accumulates. It is well known that supplies of saltpeter obtained in this way were used in the Revolutionary War, the War of 1812, and the Civil War in the United States.

Nitrate of potassium is now obtained for use in the United States from two principal sources. The chief of these consists of a process of manufacture in which nitrate of sodium from Chile is combined with chloride of potassium which was formerly obtained from Germany as the "muriate of potash," the interaction of these two substances resulting in nitrate of potassium, which is purified and recovered by crystallization. According to the available statistics for 1905, nitrate of potassium to the amount of 7234 short tons was manufactured during that year from Chilean nitrate and German muriate. A later report indicates that the production from these sources was over 14,000 tons in 1913, an increase which was probably due, in considerable part, to contracts for blasting powder for use in the Panama Canal zone, specifications for which required the use of black "potash" powder, made from nitrate of potassium.

Saltpeter From India Used in the United States

The other principal source of saltpeter in the United States is the crude nitrate of potassium known as Indian, Bengal, or Calcutta saltpeter, which has long been a regular article of import to the United States, as well as to many countries of the Old World. This is obtained chiefly from the great alluvial plain of the Ganges in India and the upper part of the Indus River. It is a product derived from leachings of the soil, and is made in native workings commonly referred to in English publications as "saltpeter plantations." This material comes to the United States direct from India or by way of England. Records of imports of saltpeter from all sources, but chiefly direct from India or transshipped from India by way of England to the United States, are as follows:

IMPORTS OF SALTPETER IN THE UNITED STATES, 1911–1918
(In Short Tons)

Calendar Year	Crude (Short Tons)	Refined (Short Tons)
1911	3,972	369
1912	3,256	142
1913	4,826	203
1914	1,115	135
1915	3	...
1916	5,769	2
1917	4,606	368
(a) 1918	1,825	2

(a) For six months, January-June, 1918.

The ordinary grade of the saltpeter received in the United States from India is nitrate of potassium about 90% pure, the remaining 10% consisting of chlorides and sulphates of sodium and potassium, with moisture and some insoluble matter. It usually comes to this country in coarse granular form, and to make it suitable for most purposes it is put through a refining process that eliminates the chlorides, sulphates, and other impurities. Before the war the market quotation for this crude saltpeter ranged from 3½ to 4c. per lb. in carload lots, or from $65 to $80 a short ton. In 1915, the import of saltpeter from India was cut off, but later, by arrangement, imports for use in munitions were resumed, although the wholesale cost of the product later increased to about 11c. a pound.

Chile a Potential Source of Potash Saltpeter

The most noteworthy announcement during 1918 in connection with saltpeter was made by one of the officials of the Du Pont Powder Co., who reported the recovery in quantity of nitrate of potassium as a byproduct from the company's oficinas in Chile. Practically all the Chilean nitrate exported contains an appreciable percentage of nitrate of potassium; and in some parts of the pampa the caliche is richer in potassium than in others. The nitrate ordinarily made at the Du Pont company's oficina Delaware is said to average about 5% nitrate of potassium. This refers to the product made by the usual process, in which a concentrated solution derived from boiling the raw caliche is cooled, and the usual crop of nitrate crystals is obtained from it. Ordinarily the cool mother liquor is returned to the tanks to be reheated, this being the solution in which more raw caliche is boiled, and the crystallizing process repeated. However, the Du Pont company found that, by evaporation of the mother liquor that comes from the crystallizing pans, and by cooling a second time, another crop of nitrate is obtained that is much richer in potassium nitrate than the first. This is said to average about 25% nitrate of potassium. It is reported that, from October, 1914, to October, 1917, about 20,000 tons of high potash nitrate had been produced, of which one-fourth was the potassium salt. Information concerning the innovation has been generously shared with other companies, so that the Chilean fields may become an important source of potash saltpeter, if there continues to be a demand sufficient to encourage its production.

The import records show 1750 short tons of nitrate of potassium received from Chile in 1917, doubtless referring to shipment of the mixed salts in which nitrate of sodium predominated. In 1918, the import of the so-called potassium salt from Chile was prohibited by one of the war boards, as it was considered that the need for the ordinary Chilean nitrate for munition use outweighed the possible agricultural value of the potash-enriched salt, but it is possible that much of the potash salt came under the ordinary designation of nitrate of soda. This action implied that the military need for additional nitrate of potassium was not great.

About 115 tons of crude nitrate of potassium, similar in grade to the saltpeter that comes from India, was brought from Mexico to the United States in 1917. In 1918, shipments totaling 62 tons and possibly more came from the same source. Production by means of the same methods as are employed in India has been carried on for many years in various parts of Mexico, and consideration has been given to the possibility of

stimulating the output to supply requirements for the material in this country.

About 33 short tons of nitrate of potassium was received during 1917 from Japan. Information as to the source of this supply is not at hand. Recently, the principal demand has been for the manufacture of explosives, that is, for making the relatively small amount of black powder that is still used in modern warfare. Some black powder is made with nitrate of sodium, but that made with the potassium salt is considered more reliable, and, consequently, is preferred where dependence must be placed on uniformly good quality. Lately the principal uses of black powder have been as a loading charge in shrapnel, where, because of the fact that the bursting force of black powder is slower than that of the high explosives, it is better suited to scattering the fragments. Black powder is also used as a primer or igniting charge with other less easily ignited explosives. It forms a constituent of military fireworks, including signal lights, rockets, and colored lights.

Saltpeter was formerly used in considerable quantities by meat packers; and it is understood that the crude material received from India was satisfactory for this purpose. Its function in the packing industry consisted in preserving and intensifying the red color of salted meats, such as corned beef, dried beef, pork, bacon, hams, and sausage. Nitrate of sodium serves as well as the potassium salt; in fact, weight for weight, it is more effective than nitrate of potassium. Formerly the use of nitrate of sodium in this way was discouraged by the meat inspection authorities, because of small amounts of certain impurities generally found in the nitrate of sodium from Chile, which have been considered objectionable for use with meat. Now, however, because of the scarcity and high price of potash salts, a specially refined grade of nitrate of sodium has been produced by a number of manufacturers, which has found ready acceptance by the meat packers as well as by the inspectors. It is stated on good authority that it is doubtful if there will be a resumption of the use of nitrate of potassium by the packers unless the potassium salt should become so much cheaper that it would compete with the specially refined grade of nitrate of sodium now used for the purpose.

Comparative Value of Chilean and Potash Saltpeter as Fertilizers

Under normal conditions a large amount of the nitrate of sodium from Chile is used as fertilizer, and, where properly used, the benefit derived therefrom in increased crop yields is well recognized. Chilean nitrate is rated for fertilizer use on a basis of its nitrogen content, this element being one of the fertilizer constituents essential to plant growth. The nitrate is considered the most directly available or assimilable form of nitrogen for plants. However, saltpeter, or the nitrate of potassium, contains not only the desirable nitrate fertilizer constituent, but potassium, another of the important fertilizer elements. The potassium of saltpeter, of course, is also in readily water-soluble form, and this salt is therefore apparently a most effective fertilizing agent to afford a supply of both of those important constituents.

Saltpeter and saltpeter-bearing earths have long been used as manure by cultivators in India and Egypt where there is an available local supply. Records from experimental stations in India show remarkable increases of yield from the use of saltpeter for manure for various crops, including tobacco, millets, garden truck, wheat, potatoes, jute, rice, and sugar cane. Extensive use of saltpeter as fertilizer is supposed to have been prevented by the relatively higher price of nitrogen in the form of this salt, and because both nitrogen and potash can ordinarily be obtained cheaper in the form of other compounds.

The Pricing and Valuation of Nitrate Salts

Chilean nitrate of soda, when used as fertilizer, is priced on a basis of its nitrogen content. The ordinary commercial grade, which is about 95% pure, is usually designated in fertilizer terminology as carrying about 15.6 units of available nitrogen. Before the war this salt retailed for about $40 a short ton, so that the nitrogen it contained may be assumed to have had a normal fertilizer value of about $2.50 a unit. These factors may be used to determine the corresponding fertilizer price of the nitrogen in nitrate of potassium.

Pure nitrate of potassium contains 13.85% of the element nitrogen, and saltpeter containing 90% of nitrate of potassium may be said to carry 12.5 units of nitrogen. At $2.50 a unit, this nitrogen may be considered to have a fertilizer price equivalent to $31.25 a short ton, or about 1¼c. per lb. The fertilizer price of potash is usually estimated in a similar way, the retail sale of potash salts before the war showing a normal price of about 75c. a unit for potash (K_2O). Nitrate of potassium, 90% pure, is equivalent to about 42 units of potash, which, at 75c. a unit, would be worth $31.50 a short ton. This is about 1½c., per lb. for the potash at pre-war prices, although potash would undoubtedly bring much more than this now. Thus, stated in terms ordinarily used in the fertilizer industry, saltpeter 90% pure should be worth at least 3c. per lb. for fertilizer. As nitrate of potassium usually is not obtainable at this price, it has not been extensively used for fertilizer in the United States.

The refined nitrate of potassium known as "technical" is quoted in current price lists of chemicals at much higher prices than those mentioned. During the 10 years 1903-1913, prices for refined nitrate of potassium, 99% pure or better, ranged from 4½ to 5¼c. per lb., although price lists for general chemicals issued recently have quoted potassium nitrate at 30c. or more a pound.

Summary

In summary, therefore, it may be stated that saltpeter—meaning nitrate of potassium—is not now so important a commodity in warfare as it formerly was, for although it still forms an essential ingredient of black potash powder, the use of this as a propellant or bursting charge in ammunition has been largely displaced by other forms of explosives that do not require nitrate of potassium in their manufacture.

The saltpeter referred to should not be confused with the nitrate of sodium that comes from Chile, which is still a very essential constituent in the manufacture of nitric acid, and thus of explosives. The market for nitrate of potassium is small as compared with that for

nitrate of sodium; and, although the prices quoted for the potassium salt are higher than those of the corresponding sodium salt, there may be difficulty in disposing of very much larger quantities of nitrate of potassium than are now used, even though the price be somewhat reduced.

Potassium nitrate is undoubtedly an efficient fertilizing agent, both on account of the potash and the nitrate it contains. If saltpeter could be obtained regularly at a price that would compete with established fertilizer prices, it is entirely probable that a much greater amount would be used than has ever yet been consumed in this country.

The Alunite Problem

BY W. F. DOWNS*

The recovery of potash and alumina from alunite is, apparently, feasible, if merely the recorded composition of the mineral is considered. The alumina present in excess of that needed to satisfy the sulphur oxide radical present should yield readily to the solvent action of mineral acid, to form aluminum salts of the acid employed; and, by lixiviation, the potash and aluminum salts of the acid used, together with the released sulphates originally present, should be freed from acid-insoluble impurities. This would give an aqueous solution of potash and aluminum salts; and the problems of their preparation for market are well known.

Alunite of the composition 11.4% K_2O, 37% Al_2O_3, 38.6% SO_3, and 13% H_2O (Dana) is not found in quantity. It carries silica in varying quantities up to 50%, and iron oxides, phosphoric acid, lime, and magnesia are frequently present in appreciable amounts; also, the potash is often partly replaced by soda, as in feldspars. The presence of impurities adds to the complexity of the problem, and, so far as is known, none of the attempts to treat alunite by the solvent action of acids has recorded a success.

The geological reports of the U. S. Government and of several Western states record occurrences of alunite, and many private mining reports describe particular deposits. Nearly all these reports show wonderful potential values of the potash and alumina contents, but none of them indicate how to recover these materials. They are right as to the value of the contents of the deposits, but until a practicable method of recovery is available to the owners, the reports might as well compare the value with that of gold in sea water. Alunite deposits are known to be extensive, and the value of the component parts is so great that it is natural that their recovery should invite much research investigation.

Active work on the problem was begun before the war; and the prices then obtaining for both potash and alumina were sufficient to make investigation appear worth while. The conditions produced by the war greatly enhanced the value of both substances, and added still further to the attractiveness of the project. In view of the difficulty of securing an abundant supply of high-grade alumina for the manufacture of aluminum, the use of which is expanding so enormously, this question becomes of considerable economic importance.

Many years ago, in the north of Italy, alunite, or alunitized rock, was roasted for the purpose of obtaining "Roman alum," or some uncertain form of mixed sulphates. This practice indicated an important fact, which helps in the solution of the alunite problem: the action of heat breaks the bond of insolubility of this alunite, and permits, by leaching, the recovery of most of the sulphates which have not been lost by volatilization during the heating operation.

One large operation has been commercially successful in its treatment of alunite by using patented processes which have recovered solely the potash. The alumina residues of these operations are still potential in value, as well as refractory to treatment. Some operators have tried to use the calcined alunite to carry potash into fertilizers by mixing with acid phosphate. This is fraught with danger, on account of the subsequent reaction.

All of the various methods which have been proposed have received patent protection, and some of them are now being or are about to be exploited. None of these new processes, as yet, has a record of production, but enough has been done under one of them to warrant the modification of the initial statement of this article into: "The recovery of potash and alumina from alunite is easy and feasible." The technology, rationality, and operation of this method have been approved by experts of the highest character; and underlying the operation are certain fundamental features which will help to solve other problems.

Alunite carries, if pure, 87% of valuable components, viz.: 38.6% SO_3, 37% Al_2O_3, 11.4% K_2O. To obtain all these would be ideal. In practice one can profitably use grades which carry from 70% to 75% of these materials and recover most of two of their ingredients. The SO_3 is not sufficient to satisfy all the bases present, but is more than enough for the alkalis. The excess of SO_3 present over alkali needs is easily evolved at low temperature. Its evolution would make the operation troublesome, on account of the great difficulty of maintaining satisfactory heat conditions throughout large quantities of such substances. This SO_3 can be changed from its alliance with Al_2SO_3 at low temperature, by mixing with the alunite some base which has a controlling affinity for SO_3. When the resultant salts are thus formed, the alumina and silicates and silica in the mass can be separated from all soluble sulphates by lixiviation, and the potash recovered from the solution. The alumina can then be separated by any one of several methods.

The special features are, recovery of nearly all of the potash, recovery of 90% or more of the alumina, and the high grade of the alumina produced. The last named is recovered as hydrate, and a standard of 99.5% in maintained.

*Mining engineer, 26 Cortlandt St., New York.

Chats, or Tailings From the Zinc Mines in Missouri and Kansas, and chert, slag and waste from iron mines, are now used for road metal, railroad ballast, concrete, roofing gravel, and for other purposes for which ordinary crushed stone was usually considered preferable. According to H. A. Buehler, State Geologist of Missouri, the quantity of chats shipped from the zinc mines in 1917 amounted to 1,426,716 short tons, a decrease of 1,464,254 short tons (50%). The quantity sold for railroad ballast (1,010,620 short tons) decreased 55%, and that sold for other purposes (416,096 short tons) 33 per cent.

Sanitary Engineering in a Tropic Mining Camp*

By HARRY N. JENKS†

MOSQUITO control and camp sanitation are effectively preserving the health of Europeans and natives in the jungles of India. Intensive clearing and drainage—utilizing cheap labor rather than oiling, on account of the expense of the latter—are the principal methods used by the Burma Mines, Ltd., at the frontier town of Namtu, in the Northern Shan States, Burma. Sanitation problems also include water supply, sewage and refuse disposal (conservancy) and general sanitation. The camp is on the Namtu River, 550 miles from Rangoon, in a region of irregular topography varying from 1755 to 2100 ft. above sea level. Until 1911, when the smeltery was moved from Mandalay to Namtu, nothing was done in the way of sanitation beyond the barest necessities. However, with the establishment of the smelting works and refinery, together with the accessory plant and shops, this village was made the center of the company's activities, and the attendant rapid growth of the camp made it necessary to provide a satisfactory water supply and adopt a system of conservancy. A few house and street sweepers were employed to care for the bungalows and compounds, and a small force was engaged in removing and burying in trenches the night soil from the camp. By this time, also, the jungle had been cleared of the larger trees, for use as timber and firewood, thus affording relief from the previous almost nightly maraudings of tigers and cheetahs, diminishing greatly the danger from snakes, and making it more convenient to get from one part of the camp to another.

By 1913 Namtu had grown to be the most important mining camp in the country. Native labor from distant provinces and from China began to appear in great numbers; and, next to Rangoon and Mandalay, Namtu contained the largest group of European residents in Burma. Realizing the importance of greater sanitary vigilance, in view of the increasing population, the company established a sanitary department to work in coöperation with the medical department, in guarding the health of the community.

The personnel of the medical and sanitary staff consists of one European sanitary engineer, two Indian sanitary inspectors, six compounders and dressers, two overseers, one sanitary sweeper, 30 hospital sweepers, eight conservancy sweepers and 20 coolies on jungle cutting and drainage.

AN OLD MINING CAMP IN INDIA

Sanitary conditions in this mining camp may be taken as typical of the rural or jungle districts. In general the fight in the Indian municipality is mainly against plague, cholera, and smallpox, and in the jungle one is face to face with malaria. Plague and cholera are more to be dreaded than malaria, but it is questionable whether there is any other single disease in the tropics that causes a greater sum total of misery and human waste than malaria and malarial cachexia. Malaria is to the resident in the tropics what colds and grippe are to those in America, especially in the New England states. In spite of the drainage afforded by the steep slopes of the hillsides of this region, the inevitable small collections of water in paddy fields and along the banks of the more sluggish streams have always furnished breed-

*Abstracted from *Eng. News-Rec.*, Jan. 23, 1919, p. 172.

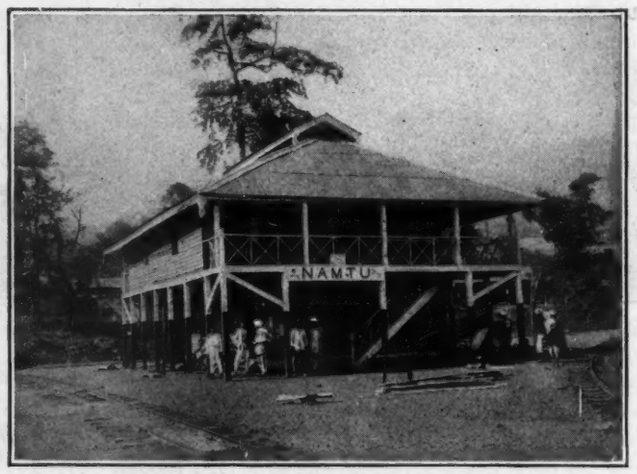
†Sanitary engineer, Burma Mines, Ltd., Namtu, Burma.

ing places for mosquitoes. Malaria may abound in the hills, because the rank growth of jungle impedes the surface run-off, and thus allows mosquitoes to breed in every available hollow, as well as in the accumulations of water found in the stalks and among the leaves of the undergrowth. Many coolies coming from the jungle stations along the railway act as malaria carriers, so that in interpreting malaria statistics a careful distinction must be made between local and imported cases.

Freedom From Typhoid Insured by Protected Water Supply

Water for the European side of the camp is derived from springs in a swampy area. It is collected in open ditches leading to an earth-lined reservoir 30 ft. square, in which it is impounded to a depth of 8 ft. by a concrete dam. The water is carried down the hillside in a 4-in. pipe, passing through two pressure-break reservoirs on the way, and is then distributed throughout the camp by pipes of various sizes. The source of supply is protected naturally by its remoteness from human habitations and by its position near the top of the slope. In this connection it should be noted that typhoid fever is practically unknown in this region.

For conservancy purposes the latrine-trenching method of the disposal of excreta has been adopted. Sanitary practice in India has, in general, favored the latrine in its various modifications as a solution of this problem. In justice to a system which in America has been practically abandoned in favor of the water-carriage system, it must be admitted that here in India it serves its purpose surprisingly well. The people are disposed to use the latrines, and a plentiful supply of labor is at hand to attend to them. In Namtu the wet-pail system



THE NAMTU RAILWAY STATION

is used, the night-soil being removed twice daily by bullock carts to the trenching grounds a mile away from camp, and there buried.

On the smeltery side, owing to the absence of cart roads, the pails must be carried to the trenches near at hand, though far enough away to avoid local nuisance. To obviate further expense in this respect, sanitary privies are now being built instead of pail latrines. In the bungalows themselves, the use of commodes, which are emptied and cleaned twice a day by the house sweeper, is found to be entirely satisfactory.

Of many limitations to the applicability of the latrine-trenching system to the problem of conservancy, one of the most obvious is that it does not provide for the disposal of waste water from house baths and kitchen sinks. In Namtu this waste water is discharged onto the ground and flows away from the house through small ditches running down the hillside. This involves expense and trouble in keeping the water from collecting in small depressions under the houses and thereby allowing mosquitoes abundant opportunity to breed on the premises. To overcome at one stroke the disadvantages of the existing method, the sanitary department

TYPICAL VIEW OF DISTRICT

has prepared a design for a comprehensive water-carriage sewerage system to serve 60 bungalows on the European side of the camp, with a new European hospital now being completed.

The sanitary department maintains a squad of street sweepers in the neighboring village of Pang Hai to coöperate with the local authorities in keeping the town clean. This is an important consideration, in view of the fact that about a third of the 3000 coolies employed by the company live in Pang Hai and Ih Aung villages.

Prevalence of malaria throughout the region is the greatest detriment to health in Namtu. The extent to which it contributes to sickness among the company's workmen and staff is shown in the accompanying table.

ANALYSIS OF MALARIA INCIDENCE, BASED UPON NAMTU HOSPITAL RECORDS

	1915		1916	
Number of Cases	Europeans and Anglo-Indians	Asiatics	Europeans and Anglo-Indians	Asiatics
Malaria	238	4,589	145	5,533
All causes	706	12,243	828	13,236
Ratio malaria to all causes	0.34	0.38	0.18	0.42

In 1916 the total number of cases among the Europeans and Anglo-Indians decreased by 39% as compared with 1915. It was in 1916 that jungle clearing and drainage work was maintained with a thoroughness not attempted theretofore. The returns for the first ten months of 1917 indicated that the total number of malarial cases for that year would be about 50% that of 1915. The increase in the number of Asiatic cases noted in the table is only apparent, and is due to the greater number of imported cases and patients who avail themselves of treatment at the company's hospital.

In the jungle itself the bamboo is regarded as the plant most responsible for the breeding of mosquito

larvæ. Especially in this the case when the bamboos are cut, thus leaving a cup in each shoot, in which the larvæ thrive. After the bamboos and larger jungle growth have been removed, the weeds and grass that spring up favor the development of larvæ by arresting the surface run-off of rain water. It seems probable that in Namtu the incubation period of the mosquito egg may, under favorable conditions, be as short as one day. That no small collection of water shall remain for more than a day after a rain, the grass on the hillsides throughout the camp is kept as low as possible, so that the surface drainage and evaporation may be materially hastened.

Jungle Clearing an Important Factor

Prior to 1917 jungle cutting was done by a gang of about 12 coolies by day labor. This was found to be unsatisfactory as regards both expense and quantity of work done, so that during 1917 the work was let out on contract, with a great improvement in rapidity and thoroughness. The tool with which the cutting is done is known in Burma as the dah, and is similar to the Cuban machete. The dahs vary in weight and form according to the character of the brush to be cut. For

COOLIES USED IN CLEARING JUNGLE

the grass-cutting work we use the Kachin pattern, which is long and light. The ground is too uneven for the use of scythes, but short sickles are employed to advantage on the tough wire grass that grows near the streams.

The usual method of oiling mosquito-breeding collections of water finds little application in Namtu. Aside from the almost prohibitive expense, there are no ponds of importance that do not receive a thorough flushing with every tropical rainstorm, so that in any case the oil would be promptly washed away.

Open ditches drain the few low-lying places, but these require constant cleaning to keep them free from a rank growth of weeds. It is intended eventually to underdrain the swampy areas by the use of open-jointed tile. The drawback to this is the expense, as in Burma all drain tile and sewer pipe are made on the potter's wheel.

Quinine prophylaxsis is not generally practiced here. It seems to be the opinion among the company's staff that the possible injurious physiological effects of the drug when taken in the doses required to secure more or less complete immunity are more to be feared than the chances of getting malaria. The recommended dosage is five grains every other day during the monsoon season, or from the end of May to November. It is given in the sulphate form, in solution acidulated with citric acid. At the hospital quinine is dispensed in pill form to the natives.

Poets and Engineers Have Different Views on India

Those persons in America whose acquaintance with India has been gleaned from the fiction of poets and writers who have sung the praises of India's mysteious charms, from the lovely vale of Kashmir to the golden Irawadi shore, will, if they chance to come to this country, feel under the necessity of applying a large correction factor to the sum total. The sanitarian is confronted with the problem of making what he *can* do measure up reasonably well to what he sees on every hand *ought* to be done. As sanitary and public health work is essentially a personal problem, the habits and customs of the people whom such work is to benefit are the chief factors with which the worker has to concern himself.

It is axiomatic in the East that the native "workman" never does as much as he is paid to do. He is generally a living example of that otherwise highly useful theory in structural design known as "least work." To get more work out of him requires as much, if not more, energy from the outside in the form of active supervision than is obtained from him in return. Climate undoubtedly has been the most potent factor in arresting the development of the capacity for work on the part of the indigenous population. Namtu is more fortunate than many other places in India in possessing a climate that is about midway between temperate and tropical, although during the summer months the combination of 80° temperature, 80% relative humidity and 60 in. of rainfall approaches sufficiently close to tropical conditions.

Influence of the Caste System

Perhaps the most important of all the influences that govern the character and effect of the work done among the natives of India is the influence of habit. Habit is practically the sole arbiter in the lives of the entire population, in all that they do and will not do; and this ingrained force of habit attains its most far-reaching development in the caste system. This fact furnishes many novel problems to the sanitarian. The effect of the sanitarian's work upon the people of India is at one and the same time his chief reason for enthusiasm and despair. Considering the almost limitless field for his efforts and the beneficial results that appear when unsanitary conditions are relieved ever so slightly, he is bound to be enthusiastic. On the other hand, it appears at times an almost hopeless undertaking to attempt to make any real progress, in view of the magnitude and the difficulties of the task which confronts him.

The Production of Gold in Rhodesia, South Africa, in December, 1918, was 46,014 fine ounces, valued at £192,870. Output in November was 34,714 fine ounces, valued at £145,458.

Lubrication of Air Compressors

By H. V. CONRAD*

SATISFACTORY lubrication of air-compressor cylinders is attained by securing the reduction of friction to a minimum and the elimination of carbonization of the oil as far as possible. For the proper reduction of friction, the oil chosen should have sufficient body to sustain the weight of the moving parts and so form a seal between the piston rings and the cylinder walls, and still not absorb excessive power in the overcoming of the viscosity of the oil itself.

The objections to air-cylinder oils which allow more than the slight amount of carbonization which appears unavoidable are, of course, well known, but may be briefly stated for the purpose of clarifying what follows:

1. Carbonization of the oil allows the accumulation of deposits of carbon which are sticky in the early stages of their formation, but hard and flinty later. Such deposits accumulate on the cylinder valves, in the cylinder passages, in the pipes and eventually in the air receiver.

2. Sticking or incomplete closing of the valves, and their consequent failure to act properly, is probably the chief objection to this action from the standpoint of the efficient operation of the compressor.

The formation of excessive carbon deposits is likely to be due to any one or more of the following causes:

1. The ill-advised use of an oil, such as a steam-cylinder oil, which easily decomposes in the heat of the air cylinder.

2. The use of oils of too great a viscosity—commonly referred to as "too heavy oils." These do not atomize readily, and, therefore, remain too long upon the hot cylinder walls, thus baking down to sticky carbon deposits.

3. The use of too great quantities of oil, which has the same effect as the use of too heavy an oil as far as the carbonization is concerned.

4. The failure to provide a proper screen over the air intake of the compressor, thus allowing free entrance of dust.

The objections to this carbonization, aside from the sticking of air valves and choking of the air passages, is the menace of fire entailed by carbon deposits. Carbon particles torn loose from them may become incandescent from causes which could not be anticipated by the compressor manufacturer. If such incandescent carbon particles should happen to come in contact with "oil vapor" given off by the lubricating oil, a fire might possibly be started whose menace would be small or large, depending upon how much carbon had been allowed to accumulate in the compressor and piping to the receiver. If these are kept properly cleansed at all times, there should never be any danger. This oil vapor is given off from a lubricating oil at a certain temperature called its "flash point," just a steam arises from water at a certain point.

The selection of an air-cylinder lubricant, is of course, governed to a large extent by a knowledge of the cylinder temperature it must withstand. Knowing their air pressures, the corresponding temperatures are ascertained fairly accurately, as shown in Table I, which gives the final temperature in the cylinder at the end of the compression stroke, for single-stage, and also for two-stage (or compound) compression, when free air entering the cylinder is 60° Fahrenheit:

TABLE I. CYLINDER TEMPERATURES AT END OF PISTON STROKE

Air Compressed to a Gage Pressure, Lb.	Final Temperature, Single Stage, F.°	Final Temperature, Two Stage, F.°
10	145	...
20	207	...
30	255	...
40	302	...
50	339	188
60	375	203
70	405	214
80	432	224
90	459	234
100	485	243
110	507	250
120	529	257
130	550	265
140	570	272
150	589	279
200	672	309
250	749	331

Variations from these temperatures will occur in actual practice, owing to water-jacketed air cylinders and radiation, tending to lower the temperature at the higher pressures. But at, say, 50 lb. pressure and lower the heat is likely to be somewhat greater than that given by the table, particularly if the compressor is run at high speed and also if it is not water-jacketed.

Relation of Oil Flash Point to Cylinder Temperature

The natural inference of the reader, after noting the temperatures in Table I, is that he must select an air-cylinder oil of a flash point higher than the maximum temperature commonly to be encountered within the air cylinder. As a matter of fact, this is not the case, and it need only be carefully noted that the study of the air-cylinder temperatures is useful mainly for such purposes as the testing of lubricating oils to determine their resistance against breaking down into carbon. But such temperatures cannot be taken as limits establishing the highest allowable flash point for a lubricant safe to use in the air cylinders.

For average normal conditions, the oil should be a medium-bodied, pure mineral oil of the highest quality, not compounded with fixed oils such as those of animal or vegetable origin, and should be carefully filtered in the final process of manufacture. A range of oil composition is permissible for lubricants approved for this work which are manufactured under the above-mentioned conditions. Primarily a distinction must be made between those oils having a paraffin base, as distinguished from those having an asphaltic base.

From a strictly operating standpoint—so it is claimed by some lubricant manufacturers—there is no distinction between these two classes of lubricants as to their desirability as compressor-cylinder oils, provided that both have been properly filtered in the process of manufacture to remove the carbon-forming elements. If any carbon should be formed, however, such carbon deposited by the asphaltic base oils is of a light fluffy nature and easily cleaned out, whereas that deposited by the paraffin-base oil is adhesive, hard and flinty.

*Secretary, Compressed Air Society, 30 Church St., New York.

As a guide to aid the operator in specifying the qualities to be possessed by an air-cylinder lubricant recommended for average duty, Table II is given.

TABLE II. PHYSICAL TESTS OF PARAFFIN-BASE OILS

	Minimum	Average	Maximum
Gravity, B.	28 to 32°	25 to 30°	25 to 27°
Flash point, open cup	375 to 400° F	400 to 425° F.	425 to 500° F.
Fire	425 to 450° F.	450 to 475° F.	475 to 575° F.
Viscosity (Saybolt) at 100° F.	120 to 180 sec.	230 to 315 sec.	to 1500 sec.
Color	Yellowish	Reddish	Dark red to green
Congealing point (pour test deg. F.)	20 to 25° F.	30° F.	35 to 45° F

It is suggested that those oils within the range expressed by the minimum figures be used for light duty of low pressures and temperatures, whereas those expressed by maximum figures should be used for high pressures and temperatures. It is recommended that any paraffin-base lubricant intended for use in "standard air compressors" should meet the physical tests imposed by the average range of figures given in the middle column of the table. "Standard air compressors" include the following types of machines:

1. Low-pressure up to 100-lb. compressors, which may be either small-sized single-stage units, or larger-sized compound machines.

2. High-pressure compressors which are constructed with the proper number of stages, so that no excessive temperatures are ever reached.

In other words, this lubricant of average test figures is always recommended unless a compressor manufacturer specifies in his literature that a high flash-point oil should be used to meet the conditions peculiar to his machine. It is thus obvious that it is never necessary that a lubricant should possess a flash point as high as 500° unless abnormal conditions of high temperature prevail. Such high flash-point oils have an unusual tendency to produce carbon deposits.

Asphaltic-Base Lubricating Oils

The asphaltic-base lubricating oils are considered separately for the reason that the lower limit of gravity stated in the above table, namely, 25° B., eliminates this entire group from consideration—which is not the intention of this article. As a guide for the selection of suitable oil, Table III is given.

TABLE III. PHYSICAL TESTS OF ASPHALTIC-BASE OILS

	Minimum	Average	Maximum
Gravity, B.	20 to 22°	19.8 to 21°	19.5 to 20.5°
Flash point, open cup	305 to 325° F.	315 to 335° F.	330 to 375° F.
Fire	360 to 380° F.	370 to 400° F.	385 to 440° F.
Viscosity (Saybolt) at 100° F.	175 to 225 sec.	275 to 325 sec.	475 to 750 sec.
Color	Pale yellow	Pale yellow	Pale yellow
Congealing point (pour test)	0° F.	—0° F.	—0° F.

For general use it is conceded that the recommendations given in Tables II and III cover the situation as well as possible, special cases, of course, requiring investigation and special consideration before making recommendations.

Proper Quantity of Lubricating Oils

The quantity of lubricating oil to feed to the air cylinders of compressors cannot be stated in exact terms. This is because of the varying viscosity of different oils, the heat of compression, and the size of cylinder. It may be stated in general, however, that, after the cylinders have acquired smooth and polished surfaces, the quantity should be reduced to the lowest limit, to avoid the possibility of the accumulation of carbon and sooty deposits. The basis of quantity given in Table IV is recommended, subect to modifications.

It will, of course, be carefully noted and clearly understood that the results in the last column of Table IV are based on the assumption that, under average conditions of temperature and usual range of oil viscosities, a pint of oil will contain an average of about 16,000 drops.

TABLE IV. QUANTITY OF AIR-CYLINDER LUBRICANT REQUIRED. PER 10-HOUR DAY

Diam. of Cylinder, In.	Size of Cylinder, In.	Displacement per Min., Cu.Ft.	Piston Speed, Ft. per Min.	Sq.Ft. of Cylinder Wall Swept by Piston	Drops Oil per Min.	Drops Oil per 10 Hr.	Sq.Ft. Oiled per Drop	Number Pints Oil Required per 10 Hr. (a)
8	8x 8	120	344	718	1	600	718	0.0375
12	12x12	320	408	1230	2	1200	613	0.0750
18	18x18	880	496	2340	4	2400	585	0.1500
24	24x24	1730	550	3450	6	3600	575	0.2250
30	30x30	2940	600	4700	8	4800	590	0.3000
36	36x36	4550	644	6070	10	6000	607	0.3750
42	42x42	6700	696	7600	12	7200	633	0.4500

(a) Figures of last column are based upon an estimated 16,000 drops per pint of oil at 75° F.

The figures are offered merely as an approximate guide. Every individual must exercise his own judgment in modifying them wherever his own particular set of working conditions is unusual.

A leading authority on compressor engineering contributes the following: "The best way to determine the proper amount of lubrication is to take out the valves from time to time and examine the cylinder. All parts should feel that there is oil thereon. If they feel dry, the lubricators should be adjusted to feed a little more oil, whereas if oil lies in the cylinder and its parts show excessive oil thereon, the quantity fed by the lubricators should be reduced. By thus examining the machine a few times, the proper amount of oil can be determined to suit the characteristics of the particular lubricant used and the conditions under which the machine operates." This is a better way to finally determine the quantity of oil required than by adopting, without this experimenting, any predetermined number of drops.

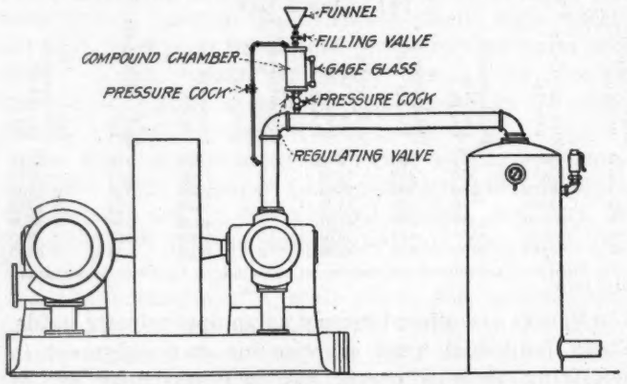
Periodical Cleansing of System

The best of lubricating oils will cause the deposit of enough carbon in the compressor system to necessitate periodical cleansing. For the removal of carbon, the machine operator should confine his efforts to the use of soapsuds. A good cleansing solution is made of 1 part soft soap to 15 parts water. The suds should take the place of oil for a few hours, and be fed into the air cylinders about once a week, either by means of a hand pump or through the regular lubricator, at a rate about 10 times as rapidly as that of the oil. The cleanliness of the air valves when inspected, as they should be periodically, will indicate whether greater or lesser applications of the soapsuds should be made. After using soapsuds, open the drain cock of the air receiver, and of the inter-cooler in the case of compound machines, to draw off any accumulated liquid. Oil should be used again for a half hour before shutting down the machine, to prevent rusting the cylinder and its fittings. Never use kerosene, gasoline, or lighter oils in an air cylinder for any purpose whatever, because of their volatile nature under heated conditions.

Cleaning Air Receiver and Piping

It often happens that oil, carbon, and other foreign matters are deposited in the air-discharge lines and air receiver. A practical method of cleaning these is shown

in cut attached, where a receptacle made of 6-in. pipe is shown set on top of the discharge pipe. The cut shows plainly the construction and what the different parts represent. If a mixture of 1 lb. of lye and 18 lb. of water is passed into the discharge line at the rate of 60 or 70 drops per min. while the compressor is running, this will eat out all the accumulation on the surface of the pipe and in the receiver; and if the blow-off



DEVICE FOR CLEANING CARBON IN AIR-DISCHARGE LINE AND RECEIVER OF AIR COMPRESSORS

valve on receiver is open, all this foreign matter will be discharged therefrom. This cleaning solution can be used every month or two, depending on how much accumulation there may be in the receiver.

Steam-Cylinder Lubrication

The proper quantity of oil to be fed to steam cylinders is much greater than to air cylinders, on account of the constant washing away of the oil by the steam. Approximately four times as much oil will be needed in the steam cylinders as in those for air, subject, of course, to variable local conditions.

Depending on its viscosity, a pint of steam-cylinder oil will furnish from 5000 to 8000 drops, and taking an average of about 6500 drops, and four times as much oil as air cylinders of same size, and working at same piston speeds, as given in Table III, the recommended amounts to feed the steam cylinders or their equivalents are given in the following table:

TABLE V. QUANTITY OF OIL FOR STEAM-CYLINDER LUBRICATION

No. Drops per Min.	Size of Cylinder, In.	Number Pints Oil Required per 10 Hr.
4	8x 8	0.4
8	12x12	0.75
16	18x18	1.5
24	24x24	2.25
32	30x30	3.0
40	36x36	3.75
48	42x42	4.5

These figures are approximate only, and will vary with the steam conditions, the kind of oil used, and its method of introduction into the steam; also with the boiler compound carried by the steam into the cylinder.

When the operator of an air compressor succeeds in obtaining lubricating oils that are giving satisfactory results, he should be cautious about making a change to other grades, particularly if cheapening the cost is advocated by purchasing and sales agents. But if a change is decided on, the performance of the new lubricants should be most carefully checked up before damage can occur to the rubbing surfaces of the compressors, and to see that no increased amount of deposit collects on the inside walls of the air receiver.

The most satisfactory way to get the quickest results is to submit the problem of lubrications to the local experts of any reputable lubricating companies, and to be governed by the recommendations, which, however, should be based on the considerations mentioned in the foregoing statement.

Manganese in South Africa

An important discovery of manganese has been made near Pretoria, Transvaal, states the *South African Mining Review*. The lode is 4 ft. wide, and has been traced so far for 300 yards, outcropping. The content is 80% manganese. Rights over the property have been secured by influential Johannesburg interests.

U. S. Employment Service

The professional and special section of the U. S. Employment Service, formerly situated at 290 South La-Salle St., has removed to 63 East Adams St., Chicago.

Engineers and professional men and women desiring the services of the professional section are requested to write to the above address for registration blanks. To secure quick service, applicants are advised to communicate with the branch which has jurisdiction over their zone district. Persons living in Illinois, Indiana, Iowa, and surrounding territory should register with the Chicago office.

State Reconstruction Committees

This letter has been sent to the Governors of all states:

Engineering Council
29 West 39th St., New York

Sir: February 11, 1919.

In many parts of our country during these winter months industry is halting because of uncertainties in governmental policies and financial conditions. Private enterprise is therefore restrained from entering upon new projects, especially undertakings requiring construction. Owing to this circumstance, and to the rapid releasing from Government service of large numbers of civil, mechanical, electrical and other technical engineers, there are now available many engineers of unusual ability and able assistants whose talents might well be utilized upon state, Federal, and municipal public works. It is an unusual opportunity to create engineering organizations composed of men above the average ability. It is important for the public welfare that these trained professional men and their assistants, as well as skilled artisans and unskilled laborers, should be usefully employed so as to prevent unrest and economic waste to the community. Even if it is wise to defer actual construction till prices are more favorable, there is a wonderful opportunity now to make plans for the future.

Engineering Council, representing the leading national engineering societies of America, therefore urges upon your consideration the appointment at once of a Reconstruction Committee, a proper proportion of whose members shall be engineers of prominence in your state; or, if you have already appointed such a committee which lacks a suitable number of engineers, that carefully selected engineers be added to its membership. Highways, school houses, and other public buildings, waterworks, sewerage systems, and public utilities are among the public improvements which may be planned, according to the needs of your state and its communities. Engineers are especially fitted to advise on projects of these designations.

It is suggested that even if at the present time lowest prices for materials and minimum wages may not prevail, it will in the long run be an economy to the state to utilize now the professional talent and labor available, in making plans for the future, and in executing work which may be urgent.

If Engineering Council can be of assistance along the lines suggested, its services are at your command. Immediate action appears to be the necessity of the day.

Very respectfully,
(*Signed*) J. Parke Channing,
Chairman.

Sampling of Dust in Mine Air*

The reduction of dust in mine air has been, and still is, the subject of considerable study. As a means of determining the quantity of dust present, a systematic method of sampling has been evolved on the Rand, and the results, together with data of a physical nature, offer a basis for preventive measures. An air-suction pump is provided with special attachments, and great care is exercised in the sampling operations.

IN THE course of such mining operations as drilling and blasting, a large amount of fine dust is produced, and, being infinitely small in size and of little weight, it remains in suspension in the air of the mine for a long time. Examinations of the lungs of miners who have died from miners' phthisis show that the lung tissue has been converted, to greater or less degree, into a mass of siliceous tissue, in which is embedded a large number of small, sharp, angular pieces of quartz. This condition is due to the constant breathing of the fine particles of dust present in the mine air.

Nature has provided means of rejecting a certain amount of the dust present in the air breathed, but when the quantity is so large and the particles are so small as in mine air, the natural filter becomes choked and allows the dust to enter the lungs.

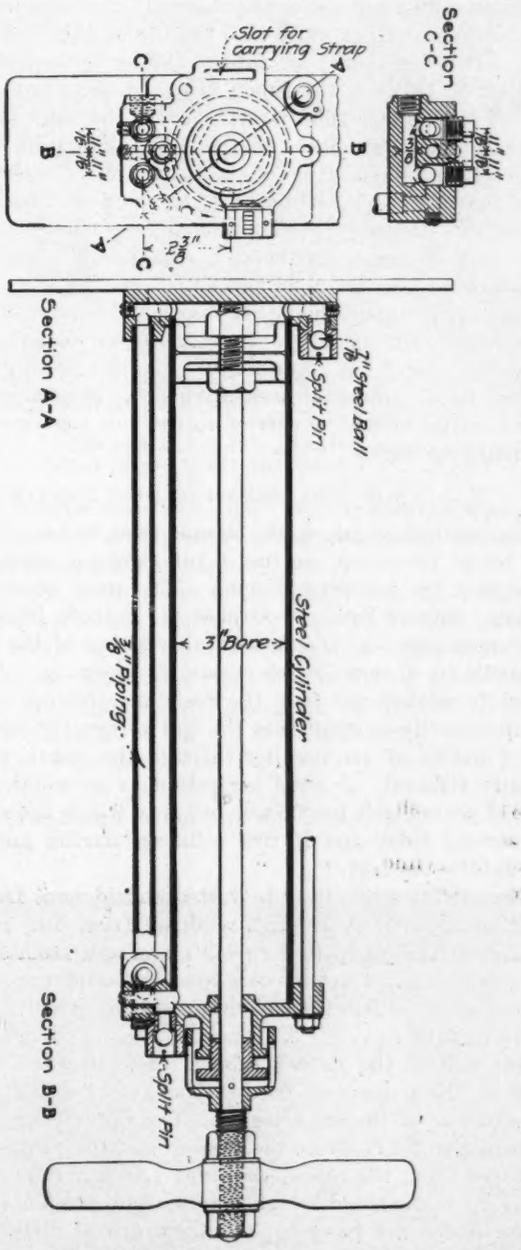
Precautions To Reduce Dust in Mine Air

The use of water to allay the dust produced in mining operations reduces the danger to a great extent. Directing a spray on the hole in all drilling operations with machines; insisting on all hammer boys using water, even in collaring a hole, and on the use of a wet swab when the hole has been started; sprays in drives, water blasts at blasting time, and other precautions effectively carried out have so reduced the amount of dust in suspension in the air that the danger of contracting silicosis, or miners' phthisis, is being materially lessened.

Periodical Sampling Determines Effectiveness of Precautions

To assure precautions to keep down the dust and to prevent carelessness in regard to the use of dust-allaying appliances, a system of sampling the mine air for dust has been adopted, and periodical tests are made throughout each mine to see that dust is being allayed to the lowest possible amount. The method consists of passing a known quantity of air through a known weight of pure sugar. The sugar, dampened with the moisture present in the mine air, becomes sticky and catches all of the dust in the air passed through it. The sugar is then dissolved in hot water and the residue of dust filtered off and weighed. Because of the minute size of the dust particles and also of their light weight, special precautions against contamination must be observed in all dust-sampling operations, and it is necessary to exercise great care in taking the samples so that the results may be dependable.

An air suction pump consisting of a metal cylinder 22 in. high and of 3-in. diameter, double acting and fitted with ball valves, is the principal part of the sampling apparatus and is shown in an accompanying cut. The pump requires constant attention, and the piston rod and ball valves should be oiled daily before being taken underground. A small quantity of medium oil should be poured into the inlet tube, and several strokes of the pump taken to introduce the oil into the cylinder. The gasket and nut at the top of the piston should be screwed down tight, and the pump tested by closing the inlet pipe and trying to pull out the piston. If the pump leaks, the piston will come up easily, which it should not do.



DETAIL OF AIR-TESTING SUCTION PUMP AS USED FOR DUST SAMPLING BY THE CHAMBER OF MINES ON THE WITWATERSRAND

The pump should be calibrated from time to time, and at least once a month against the standard air meter in the Chamber of Mines laboratory. This will give the

*Abstract of a report by J. Boyd, chief sampler, Transvaal Chamber of Mines, Johannesburg.

number of strokes required to aspirate the required quantity of air.

The sugar containers for collecting the dust are simple in construction, consisting of a glass tube (5 in. x 1¼ in.) fitted at the top with a solid rubber cork and at the bottom with a rubber cork through which passes a piece of glass tubing. On top of the latter cork is placed a small pad of cotton wool, which prevents the sugar from being sucked down the tube into the pump. Forty grams of coffee crystal sugar, ground to pass a 10-mesh and remain on a 20-mesh sieve, are placed in the tube and the solid rubber cork is fitted into the top of the tube.

A 6-ft. length of ½-in. rubber tubing is used as the connection between the sugar tube and the pump. One end of the rubber tube is attached to the inlet pipe in the pump and the other to the ½-in. glass tube which projects from the bottom of the sugar tube. It is necessary that the rubber connection be examined frequently to see that there are no leaks, and care must be taken that it is properly fastened to the pump and to the sugar tube.

The sugar tubes should be carried in a wooden box, lined with felt, of a size convenient for underground tests. A useful box is one 19 in. long, 11 in. high and 3 in. deep (outside measurement). A Fahrenheit thermometer should be carried in the box, together with a small note book.

Manner of Procuring the Dust Sample

The method of taking the sample is as follows: Having tested the pump, see that a full stroke is taken each time that the pumping is done. This must be done at a slow, regular rate—10 strokes per minute being the maximum rate—as the successful working of the pump depends on a slow, regular rate of pumping. If the pump is worked too fast, the resistance offered by the damp sugar is so great that the ball valves will leak and the quantity of air passing through the sugar will be greatly reduced. A good indication as to whether the rate of pumping is too fast or not is to watch the rubber connecting tube, and if this collapses during pumping the rate is too fast.

The quantity of air to be tested should be a fraction of 1 cu.m., and it usually requires from 100 to 120 strokes of the pump to secure ¼ cu.m. and from 150 to 200 for ½ cu.m. The time consumed in taking the sample should never be less than 10 minutes, and usually should be 15 minutes.

One end of the rubber tube is then attached to the inlet of the pump and the other end to the ½-in. glass tube of one of the sugar tubes. The sugar tube should be held about 5 ft. from the ground and the rubber cork removed from the top of the tube. As a precautionary measure, care should be taken to see that the sugar tube is not under wet hanging, so that drops of dirty water or material fall into it. It is well to remember the small quantity of dust that is to be collected and weighed and that the greatest care must be exercised by the sampler. When the sample is complete, the rubber cork is replaced in the tube, which should be cleaned with a dry, clean rag.

The dust sample should be, as far as possible, representative of the air being breathed by the men at work, and it has been found by experiment that the best place to take a sample in a drive, a raise, or a winze is about 10 ft. from the face. In a stope, the sample should be taken near the machines.

The object of dust sampling is to ascertain the amount of dust present in the air being breathed by the men working in the mine, to trace that dust to its point of production, and, if the amount is excessive, to adopt measures to abate it. After taking the sample, notes on the following should be secured: Number of the tube; place where sample was taken; time of sampling; temperature; type of machine; nature of work in progress; nature of holes being drilled; water appliances and how used; number of men and boys at face of the working; appearance of hanging; appearance of air (hazy, foggy, or other appearance) and the sampler's impression of place and work, i.e. if care is being taken and water used. The sampler should make careful observations of the dust conditions of the mine and note the number of sprays and water blasts erected and in use; see that connections to water blasts and to water jets are installed and in order, and be prepared to give an opinion of the dust conditions of the mine and of the dust-allaying appliances.

The work calls for the exercise of great care and patience; it must not be hurried and must be carried out in a careful manner.

Report of Coniagas Mines, Ltd.

The annual report for the year ended Oct. 31, 1918, of Coniagas Mines, Ltd., shows an output from the mine at Cobalt, Ontario, of 974,264 oz. of silver, comparing with 1,344,267 oz. during the preceding year. The cost of mining and concentrating in 1918 was 33.87c. per oz., comparing with 21.36c. per oz. during the previous year. The cost of smelting, refining, shipping, and marketing was 7.98c. per oz., as compared with 4.31c. for the preceding year.

The average price realized for silver sold during 1918 was 94.14c. per oz., as compared with 79.89c. per oz. in 1917. The combined sales of ore from the mine and products of the Coniagas Reduction Co. amounted to $4,099,490.

The tonnage of ore milled in 1918 was 68,597, as compared with 60,928 tons during the previous year. High-grade concentrates totaling 529 tons and 866 tons of low-grade slime concentrates were shipped, the former averaging 1164 oz. per ton and the latter 244 oz. per ton.

The cyanide plant was shut down on Nov. 20, 1917, on account of discarding the canvas tables and installing the Callow flotation process. This latter, to which another unit was added during 1918, treated all tailings from the concentrating mill, assaying 1.75 oz. per ton, as compared with 2.98 oz. per ton for the previous year.

Re-treatment of the sand tailings pile was begun in May and discontinued in November on account of the non-delivery of necessary machinery to make possible continuance of operations during the winter. A total of 21,887 tons was treated, leaving 155,113 tons of sand tailings, averaging 3.5 oz. per ton, and 40,000 tons of slime tailings, averaging 6 oz. per ton, still to be treated. Development work showed a large tonnage of low-grade milling ore, upon which the future output will mainly depend. Work done during the year included drifting, 1075; crosscutting, 383, raising, 142 feet.

A New Lead-Zinc Mill in Colorado

ANOTHER source of supply of lead and zinc has been developed at the property of the Colorado Central Mining Co., near the famous old town of Georgetown, Colo., which in former days was a rich silver-mining camp. This town is situated about 50 miles west of Denver, at the foot of some of the highest peaks of the continental divide, at an elevation of 8500 ft. above sea level.

The mill site is on a moraine placer about four miles above the town, and is reached by means of an automobile road. Its actual elevation is 9300 ft. The plant consists of a rock crusher building and the mill building, with the necessary equipment. It is designed to handle 500 tons of rock in the crusher house and 200 tons of milling ore per 24 hours. All rock is brought to the crusher house in trains by electric locomotive, and discharged into three 250-ton storage bins. The crude ore delivers from the first bin into a flight conveyor, 19-ft. centers, 24 in. wide, running at a speed of 60 ft. per min. This conveyor discharges to a 10 x 20-in. crusher, which delivers to a horizontal belt conveyor 14 in. wide and 37 ft. long.

The belt conveyor carries the crushed ore to a 40-ft.

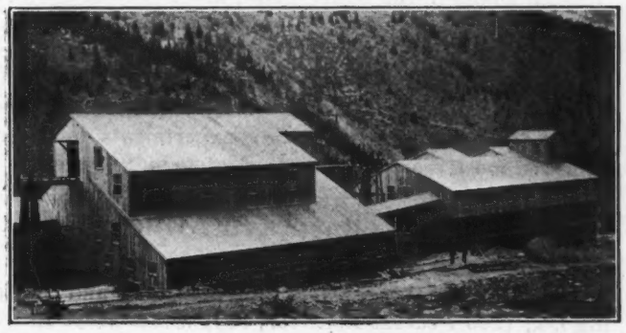


FIG. 1. MILL OF COLORADO CENTRAL MINING COMPANY

center 14-in. belt elevator, fitted with 14 x 6-in. buckets, where it is elevated sufficiently to discharge by gravity into two 3-ft. 6-in. x 6-ft. trommel screens. The oversize is diverted by chutes to a set of 16 x 36-in. rolls for crushing, and the product from the rolls is discharged directly to the horizontal belt conveyor mentioned.

The fine ore from the first trommel screens passes to another set of two trommels, of the same size. The oversize from the second screen is diverted to a second set of 16 x 36-in. rolls, and is kept in the closed circuit described until sufficiently reduced. The fine ore passing through the second set of trommels is delivered directly to a 3-pulley 14-in. belt conveyor connected with the main mill building.

The second storage bin receives stope rock of higher grade for wet treatment. The ore is drawn from the bins by special feeders and passed through a disintegrating vat 4 in. deep by 12 ft. long, from which the washed material is drawn by a double-strand flight conveyor with 24 x 8-in. scrapers, and the product is dropped onto a shaking grizzly for sizing. The fine ore passing through the grizzly is fed directly to a belt elevator, made up of 14 x 6-in. buckets at 28-ft. centers and discharged into a 3-ft. 6-in. x 6-ft. trommel screen. The oversize from the trommel screen passes to double five-compartment jigs, and the tailings from these go to waste bins. The undersize from the trommel screens is diverted to roughing tables, from which the tailings are carried out to the waste bins by means of a belt conveyor, which also handles

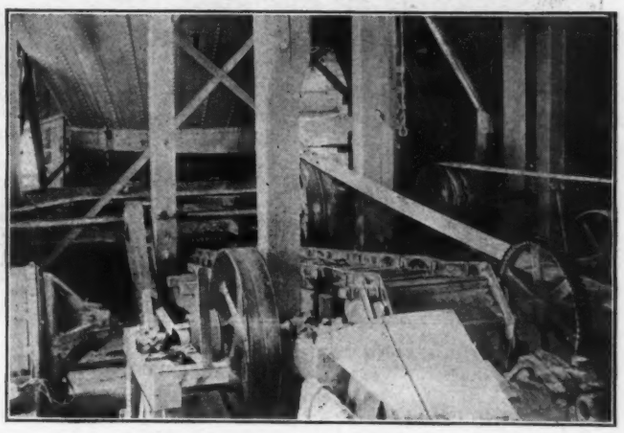


FIG. 2. STORAGE BINS AND FLIGHT CONVEYOR AT THE COLORADO CENTRAL MINING CO. PLANT

the tailings from the jigs. The conveying equipment of this part of the plant was furnished by the Jeffrey Manufacturing Company.

All the crushed ore is conveyed from the rock house to the mill on a Jeffrey 3-pulley 14-in. belt conveyor. The receiving end of this conveyor is in the rock house, where the undersize from the trommels is discharged onto the belt and carried up an incline of about 13° for a distance of 86 ft., then horizontally over large storage bins shown on the extreme right of Fig. 1. The conveyor is equipped with a Jeffrey automatic self-propelling, self-reversing, belt tripper for bedding the ore.

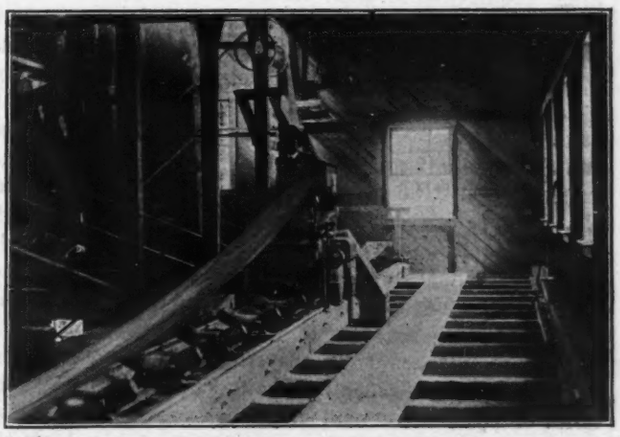


FIG. 3. BELT CONVEYOR IN THE CRUSHING PLANT

The ore is drawn from the storage bins by means of seven short Jeffrey belt-feeder conveyors and discharged onto a horizontal 3-pulley conveyor passing in front of all the storage pockets. From this conveyor the ore is elevated to a height of 45 ft. by an elevator fitted with 14 x 6-in. buckets, and discharged to 3-ft.

6-in. trommel screens. The undersize is then passed to a sloughing-off cone and distributed to classifiers and concentrating tables. The oversize of the trommels is passed to roughing tables. The product from the tables is flumed to additional classifiers and fed to five

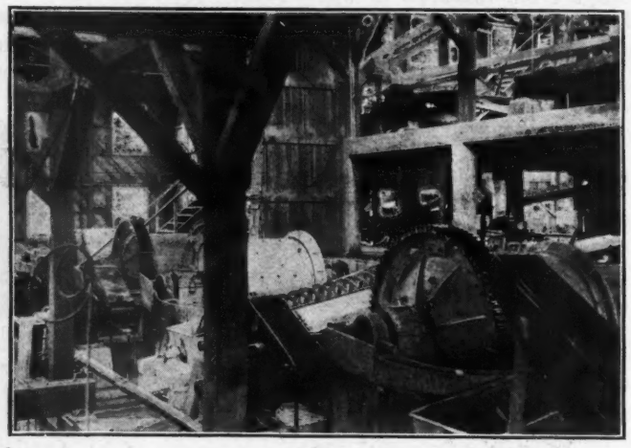


FIG. 4. COLORADO CONVERTIBLE-DISCHARGE BALL MILLS WITH AKINS CLASSIFIERS

6-ft. ball mills, where it is ground to requisite fineness for flotation treatment.

The scheme of treatment was devised by E. S. Wiard and was based on the results of a series of tests. The detail work for the plant was designed by A. W. Pick, of Denver.

New Cornelia Copper Co.

Steam shovels at the property of the New Cornelia Copper Co. at Ajo, Ariz., are now being operated in carbonate ore suitable for leaching. The reserves of this ore have proved to be beyond the amount originally estimated when the big leaching plant now in operation was planned. Below and beyond the carbonate and oxide ores is the sulphide ore that will later be treated in the concentration mill to be erected and equipped when requirements shall have been fully determined. From the company's Ajo Consolidated shaft a long drift is being driven through sulphide ore averaging about 4% copper. Three steam shovels, operating 16 hours a day, are loading 5000 tons of ore daily, and this is hauled in trains of six 50-ton cars to the crusher plant one and one-half miles from the mine. At the coarse-crushing plant the ore is dumped directly into a Gates No. 24 gyratory crusher, and from there it passes to four Gates No. 8 gyratory crushers, which reduce the size to 3½ inches. Then by means of two belt conveyors it is carried to storage bins of 10,000 tons' capacity.

The ore is taken from the storage bins on belt conveyors to the fine-crushing plant, which comprises four units of Symons vertical-shaft disk crushers. Each of these units consists of three crushers, one crushing the ore to about ¾-in. size and the two others to about ½ in. The daily output of 5000 tons of ore is put through these crushers in about 16 hours.

Belt conveyors take the crushed ore from the fine-crushing plant to 12 leaching tanks, each of a capacity of 5000 tons. The ore is leached by a sulphuric-acid solution, and the manipulation of the tanks is such that there are always nine in operation; one of the remaining three is being filled, one excavated, and one washed. Each tank remains in circuit from six to eight days, at the end of which period the tailings are removed by a Hulett excavator and hauled to the dump in a train of twelve 50-ton cars.

The solution from the leaching tanks, containing the dissolved copper, also holds considerable ferric iron, the reduction of which is required so that there will be no interference with the deposition of copper. The solution is therefore passed through towers where it comes in contact with SO_2 gas, which reduces the ferric to ferrous iron. After leaving the towers the solution goes to the electrolytic tank house, where cathode copper is made, and the solution is returned to the leaching tanks after about 3% of sulphuric acid has been added to it.

About 900 men are employed in mining, handling, and treating the ore. The plant has been operated at a maximum capacity of 5000 tons a day. That this capacity may be maintained without interruption, additions are being made, not with a view to increasing the ordinary operating capacity, but that there may be a reserve plant for any emergency. New additions include a fifth unit of Symons disk crushers, which was added to the fine-crushing plant and completed early in January; a fourth motor-generator set, which is being added to the power plant, and a second 800-gal. Prescott pump, which is being placed in the well for a reserve water supply.

The New Cornelia company began the construction of a 500-ton experimental mill in December, 1918, and this is to be used in conducting experiments to determine the most economical method of grinding ores.

Safety Devices in Mines

By A. L. H. Street*

In the case of Haney *vs.* St. Regis Mining and Smelting Co., (*205 Federal Reporter, 93*), which arose in the Joplin mining district, the Springfield, Mo., Court of Appeals lately upheld a judgment for damages in favor of plaintiff, who was injured through a fall of rock down a shaft, at the bottom of which he was working as a tub hoister. The suit was brought on the theory that the defendant company had been negligent in failing to maintain a "skidoo bell"—an electric bell by which a hoisting engineer apprises men at the bottom of a shaft that rock is falling.

The court holds that omission to install and maintain such a warning device might be found to have been negligent on the part of the company, in view of evidence tending to show common use of such devices in similar mines in the same district, yet it is decided that the company could not be charged with liability for failing to maintain the "skidoo bell," unless evidence indicated that its use would have prevented the accident.

The court lays down this rule: "In occupations attended with danger to the employees, the master must use such methods and appliances as are practical and readily obtainable and in common use in doing similar work, or show that other means or appliances equally efficient are being used by him; and a failure to do so when the methods and appliances used are not reasonably safe is a basis for actionable negligence."

*Attorney at law, 820 Security Bldg., Minneapolis, Minnesota.

Iron Ore in 1918

PRODUCTION of iron ore in 1918, as estimated by Ernest F. Burchard, of the U. S. Geological Survey, decreased 7.4% from that of 1917. During 1918 there was mined 69,712,000 tons, against 75,288,851 tons the preceding year. Estimated shipments in 1918 were 72,192,000 tons, valued at $246,043,000; those in 1917 were 75,573,207 tons, valued at $238,260,444. The average selling value in 1918 was $3.41 per gross ton. Stocks at the mines decreased from 10,628,908 gross tons in 1917 to 8,139,000 in 1918. The decrease in output was due to disturbed industrial conditions, uncertain supply of labor, and inadequate transportation facilities. Government control of the entire steel supply, which became effective in June, 1918, undoubtedly regulated the demand for ore, and stocks at mines and lower Lake ports were somewhat reduced, so that the consumption of ore remained about the same as in 1917.

The Lake Superior district mined about 60,092,000 gross tons and shipped 62,285,000 tons in 1918, or about 86% of the total iron ore mined and shipped in the United States for the year. The average selling price of iron ore at the mines in the Lake Superior district in 1918 was $3.50 a ton, compared with $3.28 a ton in 1917. Shipments of iron ore by boat during 1918, according to figures as provided by the Lake Superior Iron Ore Association, amounted to 61,156,732 gross tons, and the all-rail shipments to blast furnaces, including those near Duluth, as estimated by the *Iron Trade Review*, mounted to 1,885,000 tons. The U. S. Geological Survey figures do not include about 879,000 tons of manganiferous iron ore (ore containing 5% or more manganese) mined and shipped from the Lake Superior district in 1918.

The Southeastern states, which include the Birmingham district, mined and shipped in 1918 about 10% of the grand total. The quantity mined in these states in 1918 is estimated at 6,906,000 gross tons, compared with 8,333,766 tons mined in 1917, and shipments in 1918 are estimated at 7,249,000 tons, valued at $17,405,000, or $2.40 a ton, compared with 8,396,841 tons, valued at $16,437,775, or $1.96 a ton, in 1917.

The Northeastern states—New Jersey, New York, and Pennsylvania—mined in 1918 approximately 1,862,000 gross tons, compared with 2,340,960 tons in 1917, a decrease of 20%, and shipped 1,821,000 tons in 1918, compared with 2,379,393 tons in 1917, a decrease of 23%. The average selling value of the ore in these states in 1918 was $4.91 a ton, compared with $4.45 in 1917.

In the Western states—Colorado, New Mexico, Utah, and Wyoming—about 750,000 gross tons of iron ore was mined in 1918. Shipments amounted to approximately 740,000 tons. The average selling value of the ore in this group of states in 1918 was $1.72 a ton, compared with $1.39 a ton in 1917.

Other states, including California, Connecticut, Iowa, Maryland, Massachusetts, Missouri, Montana, Nevada, and West Virginia, in which there are small iron-mining operations, are estimated to have mined about 102,000 gross tons and to have shipped about 97,000 tons. The estimated average selling value of the ore shipped from these several states in 1918 was $3.90 a ton, compared with $3.86 a ton in 1917.

Imports of iron ore in 1918 amounted to 787,468 gross tons, compared with 971,663 tons in 1917, according to the records of the Bureau of Foreign and Domestic Commerce, Department of Commerce. The imports of pig iron (chiefly ferromanganese and ferrosilicon) were 34,711 gross tons in 1918, compared with 76,786 tons in 1917. The exports of iron ore in 1918 were 1,256,431 gross tons, compared with 1,132,313 tons in 1917, and the exports of pig iron, including a minor quantity of ferromanganese and ferrosilicon, were 269,527 gross tons in 1918, compared with an output of 656,220 tons in 1917.

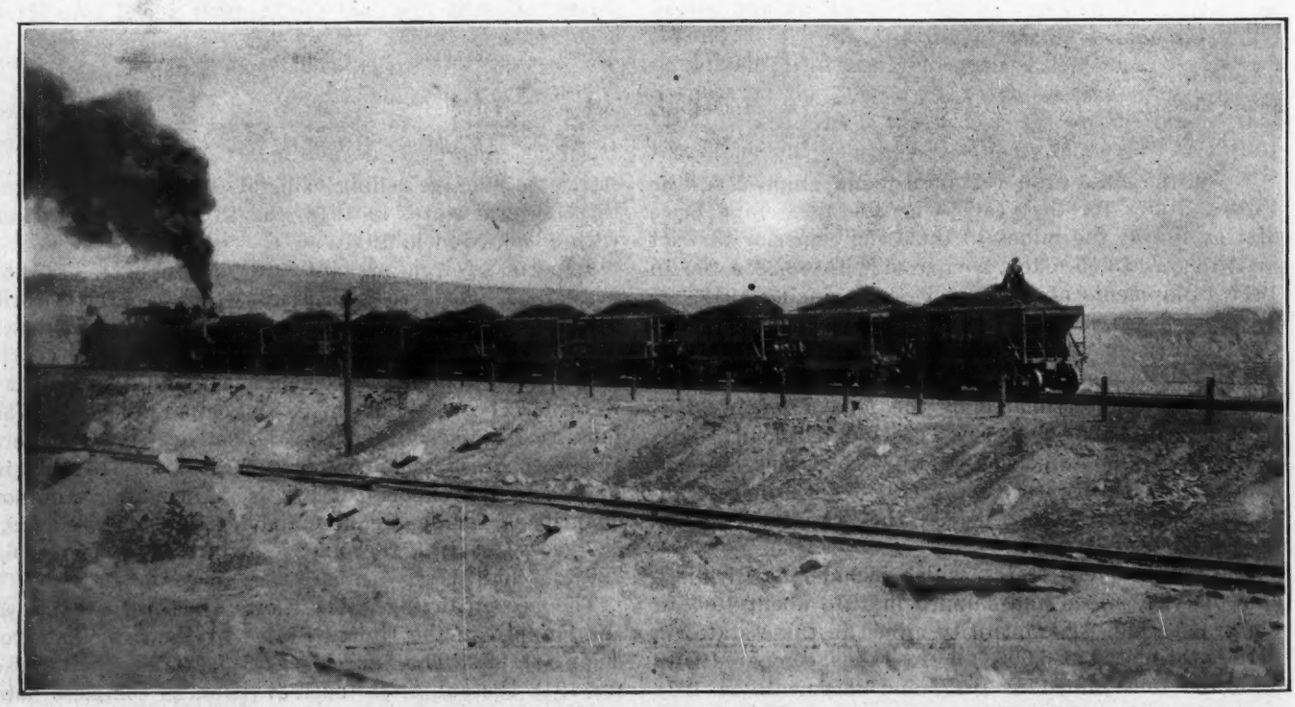
The accompanying table shows the iron ore mined and shipped in the United States by the principal producing states. The figures for 1917 are final, but those for 1918 are subject to such revision as complete data may make necessary.

ESTIMATE OF IRON ORE MINED AND SHIPPED IN THE UNITED STATES IN 1918, WITH ACTUAL FIGURES FOR 1917

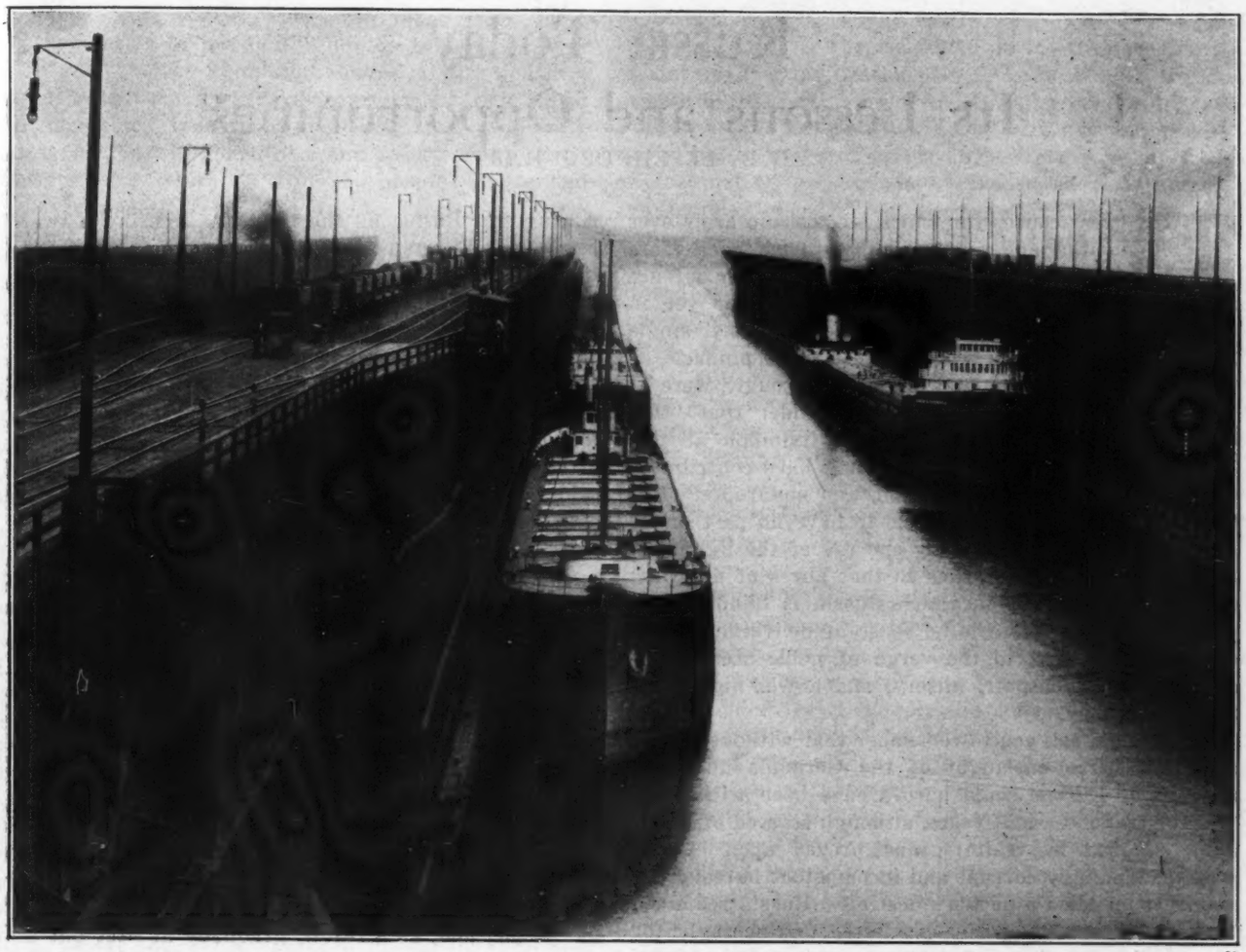
District	Ore Mined (Gross Tons) 1917 (Actual)	Ore Mined (Gross Tons) 1918 (Estimated)	Ore Shipped 1917 (Actual) Quantity (Gross Tons)	Ore Shipped 1917 (Actual) Value	Ore Shipped 1918 (Estimated) Quantity (Gross Tons)	Ore Shipped 1918 (Estimated) Value
Lake Superior:						
Michigan	17,868,601	17,131,000	17,712,916	$62,833,624	17,805,000	$63,920,000
Minnesota	44,595,232	41,870,000	44,962,127	142,901,148	43,303,000	150,261,000
Wisconsin	1,202,235	1,091,000	1,179,709	3,913,437	1,177,000	3,863,000
Totals	63,666,068	60,092,000	63,854,752	$209,648,209	62,285,000	$218,044,000
Southeastern States:						
Alabama	7,037,707	5,745,000	7,101,586	$13,049,535	6,107,000	$13,345,000
Georgia	226,630	232,000	211,501	524,175	236,000	927,000
North Carolina	599,526	82,000	611,417	1,681,616	82,000	493,000
Tennessee		417,000			415,000	1,243,000
Virginia	469,903	430,000	472,337	1,182,449	409,000	1,397,000
Totals	8,333,766	6,906,000	8,396,841	$16,437,775	7,249,000	$17,405,000
Northeastern States:						
New Jersey	489,943	470,000	474,708	$2,341,160	423,000	$2,307,000
New York	1,304,317	875,000	1,356,011	7,381,333	889,000	5,661,000
Pennsylvania	546,700	517,000	548,674	873,320	509,000	975,000
Totals	2,340,960	1,862,000	2,379,393	$10,595,813	1,821,000	$8,943,000
Western States:						
Colorado, New Mexico, Utah, Wyoming	837,673	750,000	832,056	$1,153,455	740,000	$1,273,000
Other States	110,384	102,000	110,165	425,192	97,000	378,000
Grand totals	75,288,851	69,712,000	75,573,207	$238,260,444	72,192,000	$246,043,000

Lake Superior Iron-Ore Transportation

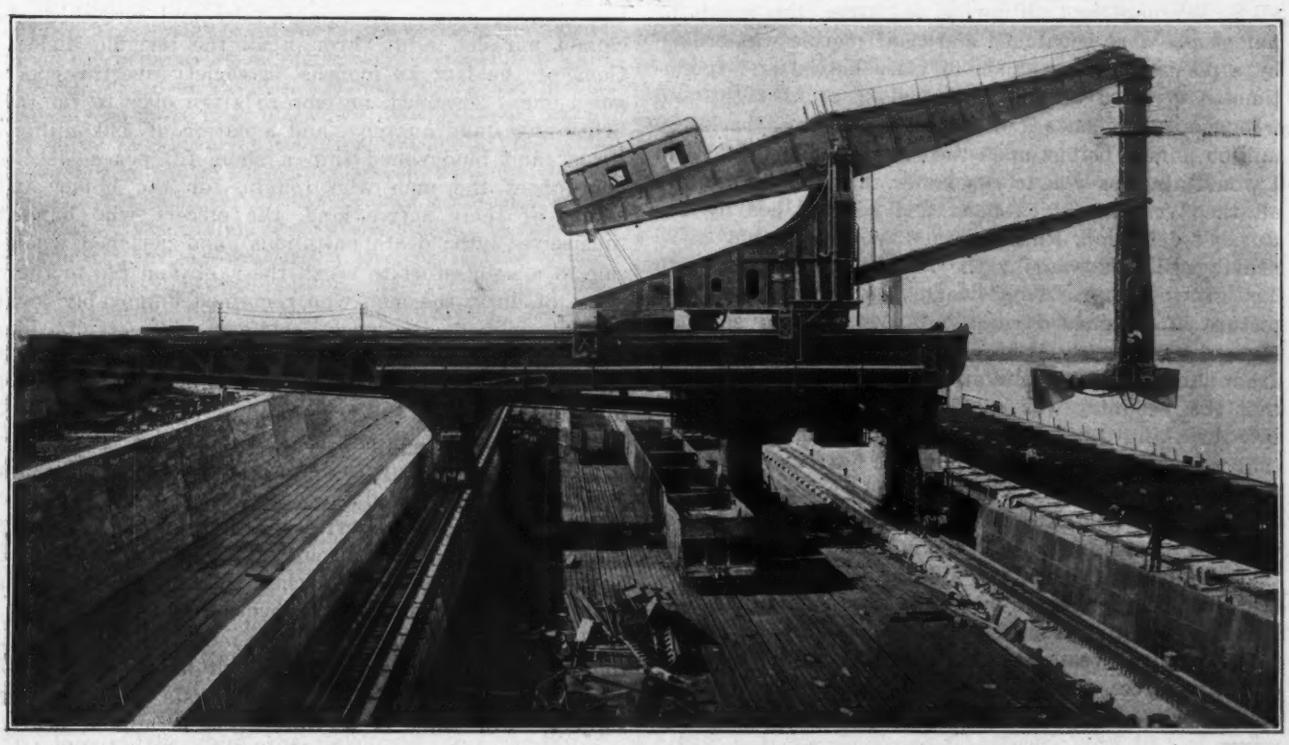
OPEN-PIT MINING BY STEAM SHOVEL ON THE MESABI RANGE. ORE IS LOADED DIRECTLY INTO 50-TON CARS



LOADED CARS ARE HAULED FROM PIT OR MINE SHAFT AND MADE UP IN TRAINS OF 50 CARS OR MORE



LOADING IRON ORE AT NO. 4 AND NO. 5 DOCKS OF THE DULUTH, MISSABE & NORTHERN RAILWAY COMPANY



ONE OF THE HULETT 15-TON AUTOMATIC UNLOADERS AT THE DOCKS AT ASHTABULA, OHIO
Eight of these machines are installed on this particular dock, the installation having been made by Wellman-Seaver-Morgan Co. The ore is removed from the hold of the boat and is carried to standard railroad cars for shipment to furnaces.

Russia Today
Its Lessons and Opportunities*

BY LESLIE URQUHART

THE great causes for which we took up arms over 50 months ago and which we have ever since unfalteringly sustained—bringing to their defence such an accumulation of power as has never yet in all the world's history been wielded by any single nation—stand now very near the topmost pinnacle of triumph. I would put it even more strongly were it not for President Wilson's wise reminder that "this business is not yet over." To that triumph all our Allies in the great League of Liberty have contributed their share of suffering, heroism, and endurance. But there is one of them that seems to have no part or lot in the splendor of it. Hardly one ray of the light that illumines our hearts reaches to that abyss of darkness and chaos and agony in which Russia is blindly staggering. For her there is no sense of deliverance, of a noble task brought to the verge of noble accomplishment, but only despair, misery, and a well-nigh inextricable anarchy.

Yet I would ask you to remember that without Russia that first fierce onslaught of the Germans upon the liberties of Europe could hardly have been withstood; that for two-and-a-half years, although starved of munitions, stabbed by traitors, and preyed upon by the most maddeningly corrupt and incompetent bureaucracy that ever muddled a nation's destinies, Russia remained faithful to the Allied cause, suffered unflinchingly for it, and abandoned it only when an internal upheaval that was like a cataclysm of nature had swept away all government and authority and when the minds of her people were bewitched and their morale was broken by a poisonous propaganda of class hatred and spoliation that rotted all discipline, all sense of right and wrong, all confidence and security, and flung back 180 million human beings upon the law of the jungle. And I would also ask you to remember that though we and all the Western Allies have had to pay heavily for Russia's defection, Russia herself has had to pay more heavily still; that during the last 18 months her state has grown progressively worse and now presents a picture of unrelieved ruin and wretchedness such as humanity has rarely, if ever, gazed upon; and that there are millions of brave Russian souls to whom the thought that their country was half cajoled and half cudgelled into breaking faith with the Allies brings a shame that gnaws deeper than the physical horrors and deprivations they are daily witnessing and enduring.

We cannot help Russia as we ought to help her if we allow our minds to dwell too much on the single fact that she dropped out of the alliance. Let us not forget that had it not been for Russia we should not now have entered the promised land of victory and peace; that for three years Russia held at least half of the enemy's forces on the East so that he was never able to bring his full weight to bear upon the Western Allies; that Russia all the time was fighting a twofold battle—the Germans and Austrians without, and corruption, treachery, and the grossest kind of administrative inefficiency within; that her industrial development and equipment were barely those of Great Britain of a hundred years ago; that German influence permeated the court, the secret police and the bureaucracy, obstructing everything, confounding everything; and that for month after weary month the Russian troops had little but their hands and naked breasts and their valorous souls to oppose to the storms of shells and bullets that were let loose upon them.

Frightful was the price that Russia paid for incompetence, favoritism and unreadiness—the loss of Poland, the ravaging of her Western provinces and casualties in killed, wounded, and prisoners that amounted to well over eight millions. Never was a trusting people so shamelessly betrayed by its rulers. And then on the top of this came the revolution, a momentary fitful gleam of hope and recovery, followed by a darkness as of death. And when they could endure no more, the word peace was uttered, and the idea of peace became an obsession. The soil was fertile for the propaganda of traitors and German emissaries, who undermined by lying words and false teaching the courage, the patriotism, and the honor of the army and the people, and, as a result, gradually at first but soon with a Gadarene rush, there ensued such a plunge into social, industrial, financial, and military chaos as even the opulent annals of human folly and wretchedness cannot parallel. But through all the terrible dislocations of the last 18 months—a society overthrown, a government scrapped, an empire given over to famine, brigandage, and anarchy, and a nation of 180 millions thrust and bludgeoned into a shameful peace—let us not forget the men who fought for the honor and sanity of their native land, the officers who banded themselves into "death battalions" and perished wholesale in a vain effort to recall the rank and file to their sense of duty, the men who remained unmovably loyal and disciplined, the great soldiers and patriots like Kaledin, Korniloff, Alexeieff, Russky, Gourko, and many others, civilians and soldiers alike, who never hesitated to tell the country the truth and struggled with magnificent courage against the traitors and anarchists working for Germany in their midst. If the Russian revolution has revealed the weaknesses of the Russian character and the savageries of which human nature is capable when it bursts through the paper wrappings of civilization, it has also enriched the scroll of heroism with many a splendid tale of devotion and self-sacrifice.

We must remember this. We must remember, too, those fundamental conditions which have always and from every point of view made Russia a staggering subject. For what is Russia? She is a land nearly three times as large as the United States, inhabited in the European portion alone by over twenty races, boast-

*A lecture delivered under the auspices of the British Russia Club and the United Russia Societies Association, in London, Jan. 9, 1919.

ing a population of nearly 180 million souls and covering an area of over 8½ million square miles. She is a land in which the towns are merely islets in a rural ocean, in which industrialism is only just beginning to take root, in which railways and schools are in their infancy and in which 85% of the people live on and by the soil, only 15% living in the towns. She was governed by an autocracy bound up with the Orthodox Church, buttressed by the bureaucracy and resting mainly on the ignorance, the devotion, the half-patriarchal, half-communistic instincts of the peasantry. The Russian people only 56 years ago were emancipated from serfdom; there has, therefore, been little time for the development of that orderly sequence of classes and grades familiar to Europe, but just the Czar at the top and the peasant at the bottom, and in between one artificial link—the bureaucracy.

When the dynasty fell, the Socialists in the Duma, representing the working classes of the towns, who are barely 10% of the population of Russia, organized the Soviet or Council of Workmen's Delegates, including in it later delegates from the rank and file of the army and navy. Kerensky was one of the leading members of this Socialist group, which formed at first the majority; but included in the Soviet from practically the beginning were the wilder spirits among the returned exiles—Internationalists, hare-brained anarchists, visionaries, German agents disguised under Russian names, Lenine, Trotzky, and the host of madmen and traitors who gradually got control of the Soviets and who are the rulers of European Russia today.

The Soviets are in the present application of the word the direct representation, in every city, town, and village, of the manual workers, to the exclusion of the thinking section of the community. The local Soviets are represented in the Central Soviet, which governs the country. The Soviet is, in short, the exclusive dictatorship of the proletariat. Popular representation is carried to an extreme absurdity, a member of the Soviet represents no more than 500 votes; every manual worker, male or female, after reaching the age of 18 has a vote—hence a confused medley of all passions, badly digested, irresponsible political theories, confusion worse confounded. Bolshevism is a subtle poison. It offers to the ignorant masses impossible yet captivating promises. It taints political opinion. It declares that the world was made for the poor, the shiftless, the disinherited, the under-dogs, the failures. It insinuates itself, almost unnoticed and unawares, in industrial or military organizations. Its keynote is the assertion that a nation is composed of only two classes, the bourgeoisie, the thinking or ruling class, and the proletariat, or working class; and that the interests of these two classes are essentially antagonistic. The ideals of Bolshevism are not those of liberty and equality. Bolshevism holds that the dictatorship of the proletariat, the exclusive autocracy of the manual worker and of the soldier, is a higher state of existence, which cannot be attained by evolution, but demands the bloody path of revolution and destruction. The proletariat, therefore, must alone be armed.

In place of the state, the Bolshevist creed required the establishment of the dictatorship of the proletariat to enforce their will on the hated bourgeoisie. To do this—and they set themselves to do it—the machinery of state and of civilization had to be destroyed. From practically the beginning of the Russian revolution, the Bolsheviks in the Soviet, directed and assisted monetarily and in every other way by Germany, at first by an insinuating propaganda of peace and class hatred and plunder, demoralized discipline in the army and among the workers at home. As their influence became stronger they openly took control of the land, the mines, the railways, the newspapers, and postal and telegraphic communications, to run them for the sole exclusive benefit of the workers; and finally the Bolshevik gang in German pay sold the country to the Kaiser, broke faith with the Allies, and by a merciless system of terrorism—ten thousand times more autocratic, cruel, harsh, and murderous than the world has ever known—have succeeded, though with constantly increasing difficulty, in maintaining themselves in power to this day.

The Soviet government is supported by the Red Guards, or an army composed of working men bedevilled by the Bolshevik creed, Internationalists, Letts, Germans, Austrians, and even Chinamen and criminals from Russian prisons.

Universal military service has been established in the country under their control; the bourgeoisie are compulsorily enrolled for hard labor in the rear, and are not allowed to enter the fighting ranks. On pain of death, officers of the former regular army are obliged to join, and are closely watched by special commissaries, who are appointed for this purpose, and recruits are obtained from among famished men by the daily allowance of 2 lb. of bread, half of which they sell for 25 to 30 rubles. The privates receive 600 rubles a month; the officers receive more. For every fighting day against the Siberian or the Southeastern armies the men are paid as much as 300 to 500 rubles. With the printing presses in its hands, printing, as at present, at the rate of 20,000,000 rubles per day, and without any care for the consequent depression of the ruble value, the Bolshevik government can well afford to be liberal in its payments to its supporters.

The officers are of three categories: officers of the regular army pressed into service, who, given the opportunity, would gladly go over with their men to the anti-Bolshevik forces; the second category, non-commissioned officers, old and disciplined soldiers of the regular army raised to officers' rank, who enforce strict discipline in the ranks—this class are simply mercenaries, but are good professional soldiers; and, lastly, there are the men, about 8000 officers, who have received six months' training and are, perhaps, imbued with Bolshevist ideas and are the most loyal enthusiasts of the Red Army.

Discipline is now strictly enforced, the death penalty and flagellation being among the punishments which are meted out for indiscipline or treason; 25,000 Chinamen and Letts who form separate battalions or are distributed in companies among the less reliable regiments, and who simply act as executioners, receive 50 rubles for each murder they commit.

The Bolshevik army numbered about 300,000 on July 1, 1918, but the inducements offered, both in pay and food, loot, and the success of the Bolshevists, have brought in many recruits, and it now numbers about

600,000 men. They are well equipped with rifles, guns, and ammunition, and the Bolshevists see to it that, whatever may happen to the remainder of Russia, they are liberally supplied with food. In fights against the Siberian army and the volunteer army of General Dennikin, the Red Guards, when in superior numbers, have put up at times a good fight; but these men, who are themselves well munitioned and equipped, have never had to fight against modern artillery of as large caliber as their own. Though it would be dangerous to minimize the strength and power for evil of this army, its constitution is such that its morale is likely to break down under a reverse, and many of the men are ready to desert to the other side.

The anti-Bolshevist forces have, in fact, received many recruits from the Bolshevist ranks; and, taking all the fronts, together they now probably number nearly half a million, of whom, however, only about a half can be said to be really well equipped. The best organized and most powerful of the anti-Bolshevist armies is the one in Siberia under Admiral Koltchak, numbering about 250,000. General Dennikin's volunteer army consists of about 130,000 men and operates in Southeastern Russia, with its headquarters at Ekaterinodar, in the Kuban; and General Krasenoff's force of Cossacks and peasants in the Don country is, perhaps, 100,000 strong. All these forces in the last six months have increased at least as rapidly as the Bolshevists and are composed of better human material. That is a significant and a hopeful sign.

Having completed the economic ruin of their country, the Bolshevists are deliberately trying to prevent the possibility of regeneration by killing off all that is best and bravest and most intelligent. It is not merely the destruction of the wealth of Russia, but the murder of her very soul, that they are attempting; and they have so far succeeded as to turn the towns in European Russia under their control into prison houses in which a terrorized people starve and kill one another to make a Bolshevik revolutionary holiday.

The manual workers have got what they wanted—they have expropriated the factories and industries, but these they cannot operate. They have paper money in abundance, but the railway workers are not working, and food is not being brought into the towns. Meanwhile, the peasants will not sell, and hide their grain for fear of confiscation, and do not produce more than they can themselves consume.

At the end of July I saw at night in Petrograd and Moscow ever-lengthening queues of terrified and starving people, crouching in the darkness and the cold round the bakers' shops, waiting for them to open. It was little enough they got by doing so. Even then bread was practically unprocurable except at about 10s. a pound; butter, eggs, and fats, sugar and tea have disappeared; meat was all but unprocurable; any kind of fuel is practically unprocurable; boots cost £50 per pair; an ordinary overcoat costs £200. They are passing through a terrible winter, a racking, hopeless winter, in which not merely scores but hundreds of thousands of Russians are doomed to die miserably without food, without fuel, without clothing, the victims of a revolution that, by destroying the means of life, destroys life itself. But the experience, though a cruel one, may prove in the end to be salutary if it teaches the bemused workmen who are their friends and who their enemies, and if it rouses the peasants to assert themselves on the side of law and order.

From the moment the Soviet came into power it denounced the war and the Allies, and Great Britain most of all. But, above everything else, it sought to set class against class and to convince the workingman that the employer, the capitalist, the man in the black coat, is his inveterate enemy. The result of this doctrine we see in the complete collapse of all normal life, the wreckage of the instruments and agencies of production, and now in the awful spectre of famine. Everybody was to be free to do just as he pleased. Everyone was to be an employer; no one was to be employed. The people were to rule, and they were taught that ruling consisted in following their own inclinations, satisfying whatever appetite the whim of the moment might suggest, loafing in the streets, doing no work, drawing large pay, stealing whatever attracted them, and, above all, marking down for arrest or murder any man of education and position. There are great communities in Russia at this moment that are falling through starvation into savagery. Into savagery because nothing rubs off the varnish of civilization so quickly or so completely as hunger. In times such as these what is worst in human nature is thrown violently to the surface; and European Russia today presents the awful spectacle of 100,000,000 people each fighting with his own hand to keep body and soul together.

There can be no doubt whatever that all over Russia men are longing for a return to order and discipline and would welcome any man or group or organization that was capable of restoring the fundamentals of civilized society. Here and there a reaction has already set in. This reaction against Bolshevism set in many months ago when the Ukraine seceded from North and Central Russia, and the unarmed and defenceless people invited the Germans to occupy their country and protect them from the Bolshevik. Conditions in the Ukraine under Bolshevik control were so anarchical that even German vassalage, with its guarantee of order and security, seemed preferable.

Bolshevism, except in the towns, never gained influence in Siberia. Land allotments are larger, food is plentiful, and the people are more prosperous and of a higher intelligence than the masses of Greater Russia. That the feeling of antagonism was especially strong in Siberia is shown by the success of small bands of Czecho-Slovaks, Cossacks, and Russians, who during last summer cleared the Bolsheviks out of the towns on the railways from the Pacific Coast to the Volga. The Siberian government established at Omsk, with which the Allies are now in close coöperation, has abolished all Bolshevik laws and regulations, has recognized foreign indebtedness, titles to land and property, has reëstablished the law courts, justiciary, and police, and is now raising and equipping a large army with Allied assistance to clear the Bolsheviks out of Russia.

The peasants, after seizing the land in their neighborhood in the first days of the revolution, found that after all, there was little to divide, as only about 10% of the agricultural land in European Russia belongs to private landowners. That though these lands in the

hands of their former proprietors produced 50% of the total grain crops of European Russia, in the hands of the peasants, without technical knowledge and proper equipment, they gave only a tithe of their former yield.

Just as the peasants are now asking the real owners to resume possession of their land, so in many a mine and factory the workmen have discovered that managers and directors, after all, have their uses, and have begged them to take over the control once more. That, so far as it goes, is a sign of returning sanity. Then, again, the Cossacks and patriotic volunteers have formed a confederation in Southeastern Russia which commands the great railways to Siberia and the Caucasus, the rich corn lands of the Kuban between the Black Sea and the Caspian, and the mineral district of the Donetz Valley. Then, too, the peasants, who are the ultimate power in Russia and who for long looked on in wondering apathy at the madness of the towns, are realizing today that it touches them very nearly, that when once you begin to confiscate, even the fruits of the peasants' toil are not exempt, and that order and security are the basis of all things. They are suffering in their own homes and persons from the universal spirit of anarchy and pillage and from the not less universal shortage of the commodities they need in their business. They love their native soil, they have no feeling of sympathy whatever for the Internationalists who repudiate all patriotism and all religion, and if they had understood what was happening they would have been utterly against a peace that involved the surrender of Russian territory. But they are ignorant, unorganized, bewildered, weary, and depressed; and it will be long, I fear, without help from outside, before they are able to assert themselves in any effective fashion. Finally, there are small Allied expeditions on the Murman Coast and in Siberia, in the Caucasus and the Black Sea littoral.

But how is a return to stable government going to be brought about? It is my firm conviction that if the Russians are left to do this alone, or with ineffective material support, the road will be long and bloody, and millions will die before the goal is reached.

What is our duty, what are our interests in these premises? Anyone can see that if Germany, even a defeated Germany, is left in a position to dominate European Russia and exploit her resources and manpower, then—no matter what happens in the West—Germany will not only have won this war, but, a decade or so from now, will be able to start a greater one with an almost assured prospect of success. Germany, said the Prime Minister recently, has no America. Germany, unless we are very careful and resolute, will find her America in Russia, and will organize in her own interests the endless resources of men and food and natural wealth of what was the Russian Empire. And if she could do that she could afford to throw over the Central Europe project; she could afford to let Turkey and the Bagdad Railway go; she could turn her face definitely toward the East and strike into the heart of Asia through routes inaccessible to us. That is a direct menace to our Eastern Empire and an indirect menace to the whole world. I believe profoundly that a dismembered, Germanized, derelict Russia would prove a source of well-nigh endless strife among the nations; and that wars as much greater than this one as this one exceeds all its predecessors will inevitably break out if Russia, with her teeming population, her incredible stores of natural wealth, becomes a prize to be snatched by the strongest power.

Germany foisted the Bolshevists on the Russian people to destroy the civilized and thinking elements of Russian society, who were loyal and still are loyal to the Allied cause. It is true, the Bolshevist movement will come to an end of its own excesses—of this there can be no doubt—but the uncultured, predatory, and materialistic elements which predominate in this organization are no friends of the Allies; they form a new bourgeoisie of, to use a Russian word, the Koulak, or of the "fist," instead of the brain. This new, uncultured, and reactionary class will by its very origin and nature have a German orientation.

The future peace of the world, in my judgment, absolutely demands and depends upon a strong, self-contained, united, and independent Russia that shall be mistress in her own household. Russia before the war occupied about one-sixth of tne earth's surface, and the restoration of law and order over this vast area, its economic rehabilitation, and its rewelding into a state powerful enough to resist aggression and to forestall a universal scramble for its markets, form, as it seems to me, the biggest series of problems that the war has so far propounded. To assist in their solution is a duty that so long as we (England) hold India we cannot shirk. It is a duty we owe to mankind and to the universal determination that this, the greatest and most terrible of all wars, shall also be the last. It is a duty also that we owe to our once great ally who spent her strength in the darkest hour, who put forth an effort beyond her powers, and fell stricken before victory dawned.

Sham sentiment and ignorance in the early days of the revolution clouded the comprehension of the Allied governments as to the Russian situation and the foulness of the Bolshevik leaders' control. The Allied governments cannot be acquitted of their share of blame for having dallied with and semi-officially recognized the Bolshevik regime, whose leaders made no secret of their desire to shatter civilization.

But now, if the statements made by their official representatives mean anything at all, the Allies and the United States have pledged themselves to overthrow the brutal tyranny of the Bolsheviks and to reëstablish law and order in Russia.

The British government, through Lord Milner as Minister for War, has declared that we cannot in honor withdraw our troops from Russia, as that would mean leaving the Russians who have joined us in all good faith to the fate which awaits them at the hands of the Bolsheviks.

President Wilson has spoken like a true friend of liberty and has said that he intends to "stand by Russia as well as France"; he has pledged himself regarding the independence of Poland, and made this question one of his fourteen points, and the Entente premiers at Versailles last July declared that a "restored Poland was essential to the peace of Europe." The carrying out of this program pledges the Allies and the United States to render active assistance to the

Polish people in their opposition to the Bolshevik attempts to join hands with their German friends, with the consequent devastation of the Baltic provinces and the annihilation of Poland as a nation.

On December 30, M. Pichon, the French Foreign Minister, in the French Chamber stated with a true understanding, and with the enthusiastic approval of the members, that all Allied actions in Russia were directed against Germany. That none of these movements constituted intervention in the internal policy of Russia, but that they were defending themselves in a country where their interests were considerable. M. Pichon stated that "the action of the Allies is aimed at preserving the healthy portions of Russia from the influence of Bolshevism," but that M. Clemenceau "had given strict orders to the French military chiefs that the efforts necessary for crushing Bolshevism shall be made by Russian forces. That Allied material support has for its object simply to allow for reorganization, so as to bring about the economic encirclement of Bolshevism." Continuing, he said, "any peace that would allow Russia to continue to exist in a state of civil war, with her present hateful and abominable government, would not be a peace of justice. We should be certainly threatened with a resumption of hostilities."

It remains, therefore, for the Allies and the United States to fulfill their promises and their professions of faith by adequate material support. There are small Allied expeditions in the North, the Murman Coast, and Archangel and Siberia; small Allied contingents have been landed at Black Sea ports, and assistance is being given by the British navy to the populations of the Baltic littoral. But none of these forces by themselves are sufficiently strong to do more than hold the ports and the country in the immediate vicinity where they are stationed.

The people in the Ukraine welcome Allied assistance; their tendency is not pro-German; on the contrary, they have always hated German military occupation and exploitation of their country. During their occupation, however, the German troops kept law and order and stamped out the Bolshevik peril. The Allies have ordered the Germans to clear out of the country. They are bound, therefore, to assist the Russians by every possible means to fill the gap that is thus created. Otherwise, what is already happening in Courland, Livonia, Esthonia, and Poland will be repeated in the Ukraine, the granary of European Russia. The withdrawal of German troops from the Baltic provinces has meant the immediate devastation and occupation of the country by the Russian Bolshevik Red Guards, and the spreading by every method of terrorism of their poisonous propaganda.

It must surely be clear that the efforts necessary to stamp out Bolshevism in European Russia cannot be generated from within. The patriotic elements in Central Russia have no military organization, nor arms, nor equipment, nor food; and they are separated from the small Allied contingents at the ports by hundreds of miles of Bolshevist territory. Unless, therefore, the Allies seriously address themselves to the task, the only hope for the liberation of European Russia rests with the Russian forces that are being slowly organized in Siberia and the Southeast. And that hope, considering the enormous difficulties of transport and munitionment, cannot be early realized. The fate of 100,000,000 human beings in North and Central Russia is at stake. Are they to be abandoned to the living death of Bolshevism, or are they to be rescued with the help of the Allies? Can there be any doubt as to which alternative should be chosen?

The Allies are assisting the patriotic elements on the confines of what was the Russian Empire, but these elements are scattered, are almost without means of intercommunication, and depend for their equipment as fighting forces on supplies brought many thousands of miles from their respective bases. Before they can effectively coöperate, or offer anything more than a localized resistance to the enemy, and, still more, before they are in a position to subjugate him, many millions of European Russians, I fear, must perish in infinite wretchedness.

And every month's delay in recognizing the Bolshevists for what they are—the enemies not only of Russia but of all mankind—merely enables them to entrench their position, to gather more power and authority into their hands, to expand their program of murder and spoliation, to attack, plunder, and devastate neighboring states as they are doing at this moment in Poland and the Baltic provinces, and, finally, to join hands with their friends in Germany and to aim at the overthrow of the entire structure of European society. I say deliberately that if a policy of economic encirclement, coupled with a determination to leave it to the Russians themselves to crush Bolshevism, is all that the Allies can contribute to the solution of this appalling problem. then God help the Russian people.

There is a natural disinclination among the Allied statesmen to embark on what may seem to be fresh military commitments, and it is not to be wondered at that there is a general feeling among the soldiers of the Allies who have borne the brunt of over four years of this terrible war, that they should not be compelled to participate in further military operations on new fronts far away from home. It has already been officially stated that the British and Allied forces in Russia are small, and that their withdrawal in the near future is contemplated so soon as volunteers can take their place. That these volunteers will be forthcoming there can be little doubt if it is explained clearly that the intention is that they should act as a police force to keep law and order at essential points while the Russians are organizing themselves for their fight against the Bolshevik enemies of the Russian nation. The actual size of such forces is of secondary importance to the moral effect which the presence of Allied troops would have in stopping the spread of Bolshevism. There is nothing the patriotic Russian elements desire less than that the Allies should prejudice their cause by military operations against the Bolsheviks—all that they pray for is that the Allies, out of their plenty, should supply them liberally with arms, equipment, and munitions which they so sadly lack, and give them the chance to organize themselves to clear their country of these enemies of mankind.

I am convinced that, to be of any lasting use, the Russian forces, with Allied material assistance, must strike at the heart or head of the trouble, not at the

extremities. If the winter closing of the Baltic makes a military occupation of Petrograd and Moscow too difficult an enterprise at the moment, then at least the Ukraine can be saved from Bolshevist terrorism and its great wealth of food preserved for distribution among the famishing population of Greater Russia. The advent of Russian anti-Bolshevist forces into North and Central Russia, bringing with them food from the Ukraine as also from Siberia and the Southeast, will be welcomed by the starving population with open arms. But quick action is necessary. There is a surplus of at least 1½ million tons of wheat and other grain stock in the Ukraine at this moment; the Bolshevists are too busy on the Ural and Southeastern front and in the Baltic provinces to undertake the invasion of the country yet awhile, but they are doing all they can through local emissaries to stir up anarchy, and, if they succeed, not only will all the crops be seized, but there will be no sowing in the spring for the next harvest. Between now and the spring is the vital time, and if the Allies utilize it to police the Ukraine, to allow the purely Russian forces to organize in their rear, to enforce the security which will induce the peasants to sow their crops, then I believe that, with the help of a volunteer Allied expedition to police Petrograd and a simultaneous move on the part of the patriotic Russian forces from Siberia, the Eastern Federation and the Ukraine, the reign of Bolshevism would be quickly over.

Military action of the kind I have here suggested does not imply interference with the political aspirations of the Russian people. It is, and should continue to be, no concern of the Allies what particular form or system of government is finally established in Russia. This is an internal affair of the Russian people, and must be left entirely for them to settle in their own way and at their own time. It would, therefore, be a fatal mistake for the Allies to tie themselves up with any political party whatsoever. There are many parties in Russia and many leaders, but though their political views are often divergent they are now united in their determination to support any healthy movement toward the establishment of law and order and of a stable government.

The Allies in their dealings with Russia must have one aim and one hope. That aim can only be to counteract the disintegrating effects of German and Bolshevist policy in Russia and to help in the reëstablishment of safety, law, and order, without which no stable government is possible. And that hope can only be that Russia, after all her suffering and tribulation, will be ruled by wise and trusted men—a country so governed is a free country, be the form of its constitution what it may.

Russia has had her revolution. She is now in the deepest bog of chaos that any nation has ever known. Some sort of military dictatorship for the restoration of public security would seem to be marked down by all past experience as the next step in her journey. And when circumstances permit the Siberian forces and those of the Southeastern Federation to join up, it is certain that Admiral Koltchak and General Denikin—both men of high patriotism, character, and ability—will form a condominium in opposing their united fronts to the Bolshevists. At any rate, it is only after the indispensable foundation of law and order has been secured that it will be possible to convoke a national or constituent Assembly that will really give the Russian people an opportunity of choosing the form of government they desire. And I venture, for what it is worth, to throw out the suggestion that this consummation is more likely to be hastened if in Russia, as in France, the Allies agree to recognize one supreme authority.

It must, however, be understood that Allied assistance implies something more than military or police action. It implies also a pooling of brains and energy in the administration of the country's public and foreign debt, the institution of banks, the organization and reëquipment of the railways, the provision of essential goods and machinery, a restarting of the wheels of commerce, a sustained and many-sided missionary undertaking in which soldiers, financiers, traders, engineers, manufacturers, and all the Allied governments will have to coöperate. For nearly four years the Russian people have been unable to procure at any price such necessary goods as clothing, boots, nails, iron, steel, and the simplest agricultural implements; and these unexampled deprivations have been the cause not only of intense hardship but also of the idleness and lethargy that prevail among the peasants and workpeople today.

Of what use is money when there is nothing to buy? Why under such conditions should the peasant produce more than he can consume or the worker be at the trouble of earning wages which he cannot spend? To reëstablish trade, and, with it, the incentive to work, is, therefore, imperative. The opening of some of the ports under Allied control has already begun to contribute materially to this end; and I am glad to say that the British government is zealously encouraging the export of British goods to Siberia and the Urals. This policy has the double effect of resuscitating the economic life of the country and of establishing sympathetic trade relations which in the future will be of the highest politico-economic importance both to Russia and to Britain. It helps, moreover, to facilitate the return to normal conditions, and that, after all, is what Russia needs for her salvation.

There is in Russia—her whole history shows it—an immense power of resilience. Although the Bolshevists have inflicted upon her damage a thousand times greater than the grimmest imagination has ever ventured to conceive, yet, in spite of everything, I have faith in her future. After all, it is impossible permanently to destroy a nation that rests on the solid, the perpetually self-renewing, basis of agriculture. The utmost injury that foreign foes or domestic fools or traitors can inflict on a country that draws its strength from the bounty of nature cannot, in the essence of things, be more than temporary. It cannot touch the deeper and fundamental sources of life and well-being. When, therefore, we know that four-fifths of the people of Russia live on the land, and that food products alone before the war furnished about 70% of the country's exports, we know that Russia is indestructible, and that though she may bend before the storms that assail her, she can never be broken.

Whatever the future form of the government of the Russian state will be, of one thing I feel certain—that the Ukraine as well as Southern Russia will again come together with Greater Russia. The Ukraine as a separate independent republic can be only a temporary creation, and was due mainly to the desire of the population to rid themselves of the Bolshevik control of Greater Russia; over 80% of her frontier marches with Russia. Over 50% of the population within her own boundaries are Russian, with whom the Little Russians are closely intermarried. Ethnologically, they are the same people, and the language is nearer to Russian than any other Slav tongue. Her industries, manufactures and railways are owned by Russians, and her economic and political system is so interdependent with that of Russia as to make it practically certain that she will in one form or another reënter the Russian state. I am no less certain that Siberia cannot afford, for geographical, political, and economic reasons, to separate herself from Greater Russia—indeed, the Siberians themselves do not desire to do so.

As to the North Caucasus, this, also, will remain Russian, and likewise, in regard to the trans-Caucasus, where 50 separate races live and 50 different languages are spoken, I am of opinion that, with the exception of Russian Armenia, which should be joined to Armenia in Turkey, it would be a geographical, political, and economic absurdity to form separate or independent states. If this were done the trans-Caucasus would again become the cockpit of warring tribes, and in the interests of the different peoples themselves the government of a strong and free Russia will be a necessity. Besides these, there are about 18,000,000 Moslems in the Russian Empire, 8,000,000 of whom are scattered throughout Central Asia. These people, speaking several dialects and three independent languages, are so surrounded by Russians, divided by sect, economic conditions and geographical distribution, and are so untutored, that it would be impossible for them to unite or to separate themselves from Russian control. There remain Poland and Finland, which will separate themselves entirely and become independent nations. The Baltic provinces may be freed, but there must be special connection with Russia in order that she may have access to Baltic ports. The late Russian Empire will thus, in my judgment, and in that of Russians who are competent to form an opinion, be reconstituted geographically much as it was before the war, with the territorial exceptions just mentioned.

But when sanity is again in the ascendant, Russia will find herself confronted with an immense foreign indebtedness. There is only one way in which she can discharge it, and that is by developing her natural resources—in other words, her soil and its contents and its products, her untold riches in timber and minerals. Those riches at present are lying idle and almost untouched.

Why? The answer lies on the surface. Russia has virtually no railways and few roads. With a population of little more than one-half, and with an area of only one-third Russia's, the United States has more than five times the mileage of railways. That explains everything. It explains why Russian industrialism is still in its infancy and why the amazing wealth of the country has never been developed. Multiply means of communication and means of transport, and Russia's material future is beyond comparison greater than that of any other land.

Russia and Siberia open a field for commercial and industrial development incomparably greater than any other country in the world. Russia cannot do this work alone; she requires the enterprise and the financial and technical coöperation of our traders, industrialists, and engineers, to the mutual political and economic benefit of the Russian and British peoples. I urge that consideration as one of the chief reasons why the British government and the British people should watch with solicitude the course of events in Russia and should frame a Russian policy on far-seeing and sympathetic lines. It is certainly an important reason, and, one, moreover, that no people living, as we do, by commerce, can ignore, and that time can only emphasize. For if economic laws are laws of nature, and govern the political economy of the universe—and it has been shown that Bolshevism in Russia was largely due to the bad economic conditions, disorganization, and discontent—it follows that a prosperous and free Russia will be a conservative and enlightened nation, a sure guardian of civilization and the future peace of the world.

It is a British interest of the first moment, and from every conceivable standpoint, that Russia should regain her freedom and her power. In helping her to do so, in exorcising the evil spirits that now possess her, we may be sure we are furthering the cause of civilization itself far more than any selfish or material interest of our own. Two things are imperatively needed if the sanity and safety of the world are to be secured and if mankind is to go forward under a happier despensation: One is that Bolshevism should be beaten down; the other is that Russia should be raised up.

Mining Congress and Unemployment

The American Mining Congress has issued a request to its members to coöperate with the War Department and the Department of Labor in connection with the finding of work for returning soldiers. A blank is being sent out, in order to obtain the necessary information, the questions asked being as follows:

1. How many miners, skilled and unskilled, can you use if sent to you at once?
2. If you cannot use men now, how quickly will you need men?
3. Estimate the number in each classification and kind of employment.
4. Wages to be paid in each classification and kind of employment.
5. How many specialized men and what?
6. Wages of specialized men?
7. Living conditions and costs.
8. Is this employment permanent or temporary?
9. Will you pay transportation from any given point?
10. Do you board your employees?
11. Have you any preference as to married or unmarried men, color or race?
12. Do you wish to specify union or non-union men?

If it is desired to apply for the release and return of any particular men, the request should be made on a separate sheet. In all cases the question as to remuneration must be answered, and information given as to whether the position is now available or will be within a reasonable time.

Platinum at Franklin Camp, B. C.

VICTORIA CORRESPONDENCE

The recent establishment of the fact that there is platinum-bearing mineral in the Franklin camp, near Grand Forks, B. C., has caused a flutter of interest in British Columbia mining circles. William Thomlinson, ore sampler for the Canadian Munition Resources Commission, spent some time in that district late last summer, and his report, which has just been published, is accepted by some as indicating that prospectors are close on the trail of the source of the platinum which has been found in the placer ground of the Tulameen River.

Mr. Thomlinson states that he is authorized to make public the following information regarding the tests for platinum made on the material taken by himself, in September, 1918, from mineral claims situated on the so-called "black lead" in Franklin camp, Grand Forks mining division. He proceeds:

"Early in the month of August I visited Franklin camp and took samples from the various workings on the Maple Leaf mineral claim, and sent the samples to the Dominion assay office at Vancouver to be assayed for platinum. Two of the samples from the Maple Leaf claim taken from an open cut from which two cars of copper ore had been shipped were found to contain, respectively, .15 oz. and .17 oz. of platinum per ton, and the results appear to me to indicate that the platinum content of the ore was roughly proportionate to the amount of the primary copper minerals, especially chalcopyrite, showing in the ore.

"Later J. J. O'Neil, of the Dominion Geological Survey, visited the Maple Leaf claim with me, and, being interested in the mode of occurrence of the platinum, took a sample of almost pure chalcopyrite, occurring as a small lense in the pyroxenite, and had the sample assayed for platinum at the Dominion assay office at Vancouver. This sample showed a content of .38 oz. platinum per ton.

"The mineral-bearing gangue on the Maple Leaf claim is mainly pyroxenite, with some tongues or inclusions of augite-syenite on the hanging-wall side of the lode, and the copper minerals, principally chalcopyrite, occur in bunches and veinlets and as disseminated specks, throughout the pyroxenite and the syenite.

"Owing to good results from the Maple Leaf samples, and noting that the pyroxenite zone, or so-called "black lead," extends almost entirely across Franklin camp, I visited and sampled all the principal properties situated on the pyroxenite-syenite contact zone. On most of the claims so situated, the lode material appeared to be barren of economic minerals; but on several of the claims there could be seen at or near contacts a tendency for the copper or iron sulphides to form mineralized belts or masses. Most of my samples were taken from places where such segregations of copper and iron sulphides occurred, and especially from where the copper-bearing minerals were in evidence, though the oxides and sulphides of iron were also included in the samples.

"Although most of the samples taken, on being assayed, showed appreciable amounts of platinum, it cannot yet be stated with certainty that more than very small portions of the 'black lead' or pyroxenite belt can be mined on a commercial basis.

"In the samples assayed there appeared to be certain proportions between the copper-bearing minerals present and the platinum and the platinum contents; but at the Mountain Lion claim the platinum appears to be entirely associated with sulphides and oxides of iron.

"Whether the platinum occurs as native platinum or as sperrylite, the arsenide of platinum, has not yet been determined; but I presume it may be in the latter form and associated with the sulphides and oxides of copper and iron where they are found segregated in the pyroxenite zone.

"On several properties, such as the Gloucester M. C., situated near to and on the dip of the pyroxenite zone, platinum may also be found associated with the sulphide ores, and perhaps it may be advisable to have all the ores of the entire camp tested for the metals of the platinum group.

"There is, however, much to be learned regarding the mode of occurrence of the platinum, and as to the average value of the material forming the so-called 'black lead.'

"It is probable that only certain portions of the pyroxenite zone contain platinum, copper, or other metals in economic amounts. Therefore, much further investigation may be required; but I certainly consider the matter worthy of detailed research on the part of the government or of the large mining corporations.

"Samples of the undernamed properties contained platinum as follows: Maple Leaf, three samples, .15, .17 and .38 oz.; Lucky Jack, three samples, .04, .06 and .08 oz.; Mountain Lion, two samples, .09 and .09 oz.; Golden Age, one sample, .06 oz.; Averill Gap, two samples, .09 and .09 oz.; Buffalo, two samples, .08 and .19 oz.; Ottawa, one sample, .06 oz.; and Columbia, one sample, .04 ounce."

Alaska Treadwell, Alaska Mexican, and Alaska United Gold Mining Companies

A report issued by President F. W. Bradley, of the Alaska Treadwell, Alaska Mexican, and Alaska United Gold Mining companies, on Oct. 23, 1918, covers the operation of those companies on Douglas Island, Alaska, for the twelve months of 1917 and six months of 1918, in addition to the secretary's balance sheet as of June 30, 1918.

A short summary of conditions leading up and subsequent to the flooding of the Treadwell, "700," and Mexican mines is given, and it is stated that the probability of reopening the flooded workings will depend on the development at the Ready Bullion mine. At this mine, from Jan. 1, 1917, to Sept. 30, 1918, there was milled 328,990 tons, which gave a total yield of $724,686.19, at a cost of $826,819.42, which includes $54,691.89 for shaft sinking, new headframe and shafthouse, and $126,428.51 which has been spent in safeguarding the mine against salt-water leaks. At the Ready Bullion, an Alaska-Juneau type of caving stope has been cut out in the foot-wall country above the 450 level, about 600 ft. inland from the shore line, to secure waste to fill the cavities left in the mine as the broken ore and caved pillars are drawn and hoisted for the mill. The report states that the shaft has now been

sunk, a crosscut started for the 2800 level, and development is being continued on the 2600 level.

The following table gives the receipts and expenditures for the three companies during 18 months ending June 30, 1918.

RECEIPTS AND EXPENDITURES OF ALASKA TREADWELL, ALASKA MEXICAN, AND ALASKA UNITED GOLD MINING COMPANIES

Companies	Receipts	Expenditures	Excess of Receipts Over Expenditures
	Twelve Months of 1917		
Treadwell	$2,370,799.93	$1,999,178.62	$371,621.31
Mexican	212,923.58	149,680.32	63,243.26
United	771,554.02	861,788.52	90,234.50 (a)
	Six Months of 1918		
Treadwell	$441,718.50	$418,006.01	$23,712.49
Mexican	35,033.33	37,933.57	2,900.24 (a)
United	190,498.99	284,622.20	94,123.21 (a)

(a) Expenditures over receipts.

Exploration at the Shakan molybdenite property consisted of a tunnel driven 320 ft. on the strike of the vein, which shows an average width of 7.7 ft. with an average of 1.89% molybdenite. In addition to the development work, a wharf, warehouse and shop have been built and a tramway to the mouth of the tunnel is under construction.

Mercantile business owned exclusively by the Treadwell company earned a profit of $76,754.81 in 1917 and $23,206.54 during the first six months of 1918. Inventory as of June 30, 1918, shows supplies on hand totaling $538,039.17.

The Douglas Island companies own and operate three hydro-electric plants, which have all been tied in with the Alaska-Juneau steam-electric plant, and this has enabled them to sell and offer for sale all their steam-electric generating machinery and boilers. Net earnings from the sale of power were $62,678 in 1917, and $15,493.51 for the first six months of 1918.

Development on the 2800 level of the Ready Bullion mine is to proceed as the mine operations pay for the work, after making as large payments as possible on the indebtedness of the Treadwell company. Mr. Bradley's report closes as follows: "The affairs and operations of the three Douglas Island companies are so interlocked that it seems more logical to wind up all their lives concurrently with the working out of the Ready Bullion mine, rather than to start any immediate dissolution proceedings. Besides, such proceedings should be postponed until the verdict for or against the future of the Ready Bullion mine has been rendered by the 2800 level development work. In the meanwhile, continued patience should be asked of the shareholders in the matter of dividend payments."

Government Tools for Trade Schools

A bill (House No. 15,625) has been introduced in the House by Representative Caldwell, of New York, under which high schools and other educational institutions in the United States may be equipped with a first-class machine shop for industrial training. The machines with which to equip these schools are now in the possession of the War Department, and Mr. Caldwell proposes that "the Secretary of War shall lend them to trade and technical schools, universities, and other recognized educational institutions, which, in the discretion of the Secretary of War, should have such equipment."

The Government is protected, it being provided that "each institution so equipped shall be responsible to the United States of America, under regulations to be prescribed by the Secretary of War, for the proper care of and the safe return of such equipment when demanded, ordinary wear and tear excepted."

There is estimated to be between $200,000,000 and $300,000,000 worth of Government-owned machine tools, bought on account of the war, of which amount perhaps one-third may be absorbed by existing arsenals. The remainder, according to the terms of the appropriation bill under which they were bought, must be sold to bring the greatest possible returns to the Government.

There is no ready market for these tools at the present time, machine shops throughout the country being overstocked on account of their expansion during the war. Therefore, the sale of these tools, unless made at a considerable loss, will be strung over a number of years, which will have the effect of demoralizing the machine-building industry and lowering wages in that field. This will also entail the storage of the tools at the Government expense, and storage charges on this class of machinery approximate 20c. per sq.ft. per annum.

The proposed plan should appeal with particular strength to labor organizations, as it will put each of their members in the mechanical trades in a position to better his equipment for competition in the labor market, and at the same time put to the best practical use equipment which he and his fellow machinists have already produced.

There is a precedent in this proposal in that the War Department has been for many years empowered to lend military equipment to National Guard organizations and other bodies for military training purposes. This material can, of course, all be recalled in case it is needed in the event of another war. Before munitions can be made, however, the United States must have the machines with which to make them, and the proposal gives a means not only to educate in the public schools of America all who desire to become mechanics, but also provides storage on this material at no cost to the Government, and insures its availability when needed.

Natural and Synthetic Nitrate

A correspondent of *The Times*, London, is quoted in the *West Coast Leader* as saying that, except perhaps in Germany, not much progress has been made in the actual manufacture of synthetic nitrate, though preparations have been made, presumably as war measures. Whether these will materialize to any extent as commercial propositions under peace conditions remains to be seen. With the fall in exchange and reduction in the gold premium, the cost of production of nitrate of soda in Chile has been reduced by about 2s. per quintal. Before the war there was almost as much sulphate of ammonia being produced as is the case now, and as the demand for nitrate of soda and sulphate of ammonia will almost certainly be far greater than in pre-war times for agricultural purposes, it is reasonable to assume that nitrate producers will be able readily to dispose of at least their pre-war output.

The Kerr Lake Mining Co. reports for the fiscal year ended Aug. 31, 1918, a production of 2,582,993 oz. of silver at an operating cost of 28c. per oz. Development work to the extent of 3088 ft. during the year maintained the company's ore reserves, despite the record production.

Ore Dressing and Metallurgy

Valve control by electrical means is an attractive idea from every point of view, and the scope of application is capable of considerable expansion. An arrangement for use in connection with the blowers which supply air to blast furnaces is described; and the details of control and the safety measures provided should prove of interest.

A mechanically operated pulp sampler, by which an impartial sample is obtainable, is a necessary part of the equipment in almost all wet crushing mills. The apparatus described and illustrated herewith is not designed along entirely new lines, but several improved features have been incorporated, and actual results have proved its efficiency.

Electrical Valve Control

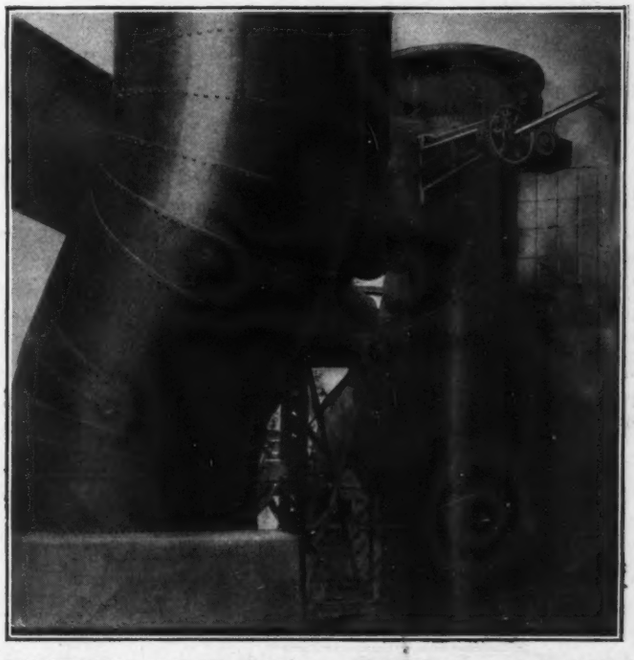
Motor-operating mechanisms have been applied to numerous water and steam valves, especially those of large size and where it was desirable to operate the valves from a distant point. However, only recently have they been used for purely industrial applications. Electrical engineers of steel plants will be particularly interested in the accompanying illustration, which shows two Dean valve controls on the delivery side of the blowers which supply air to the blast furnace of the Mark Manufacturing Co.'s new plate mill near Indiana Harbor, Indiana.

The air for the blast furnace is supplied by two Ingersoll-Rand 5-stage turbo blowers rated at 4000 hp., with a speed of 2250 to 2800 r.p.m. and an air delivery of 34,400 to 55,000 cu.ft. per min., at 14 lb. pressure. The air is taken in through two 72-in. intakes, the screened top of one of which can be seen in the illustration. The two discharge lines are 36-in. in diameter and lead from the blowers in the power house to the main discharge line just outside. There are two 36-in. gate valves placed at the point where the 36-in. lines enter the 48-in. main discharge line.

From the illustration it will be seen that the valves are approximately 15 ft. above the ground; hence they would be inaccessible to operate by hand. It would also be inconvenient to operate the steam throttle on the turbo blowers and valves simultaneously. At least two attendants would be required to close the throttle of the turbine and the gate valve at anywhere near the same time. Therefore, to make the operation of the valves convenient, and to guard against serious irregularities of the air flow to the blast furnace, two Dean valve controls were installed in the two 36-in. discharge lines, with the valve-control stations near the turbine throttles. With this equipment the engineer can start the turbine, and then, by merely placing the handle of the valve-control station in the open position, open the corresponding discharge valve. This convenient and speedy control is especially desirable when changing from one turbine to another. The importance of being able to open and close these two valves rapidly will be appreciated when it is remembered that blast furnaces are seldom shut down, although it is often necessary or desirable to shut down a turbo blower.

The Dean valve control is made by the Cutler-Hammer Co., of Milwaukee and New York. Primarily, it consists of a high-torque squirrel-cage motor, limit switches, with special gear arrangement, and one or more control stations.

The Dean system is entirely electrical in operation, using a fully inclosed motor as the source of power.



ELECTRICAL VALVE CONTROL ON BLOWER DISCHARGES

This motor runs at a speed of about 1600 r.p.m. and is connected to a system of combined worm and planetary gearing for the purpose of speed reduction to the valve stem. The gearing is inclosed in an oil-tight casing, and the limit mechanism is included in a space above the gearing, the whole, together with the motor, forming a single unit with only four bolting-down holes. All cables from the motor to the limit switch are incased in steel conduit, and the unit is as impervious to moisture as it is possible to make it. The motor is easily removable from the casing and can be changed in a few minutes.

The weak feature of most electrical valve controls is the inability to seat the gate securely under all conditions, caused by the motor circuit being interrupted before the limit of travel is reached, and the gate being allowed to drift into its seat. This drift is a most uncertain quantity and is dependent on friction of the

moving parts. The Dean system drives the valve gate directly into the seat, under power, and to the exact point of tight closing, after which the trip mechanism releases the motor and gears from the valve stem, thus entirely eliminating over-travel, due to momentum of moving parts. It is this momentum that is the cause of jamming the gate.

Control of the valves is secured by small control stations, placed in heavy cast-iron boxes suitable for attaching to a wall or floor standard; and as many points of control as is desired, for one valve, may be obtained, at any distance from the valve. Each station is fitted with indicating lights showing the position of the gate.

The application of the Dean system to an existing standard gate valve is accomplished by furnishing a new yoke and a pair of driving gears, and it may be installed without putting the valve out of service. It is particularly adaptable to valves of the outside screw-and-yoke type, as pads for the support of the unit may be welded onto the existing yoke.

Automatic Ore-Pulp Sampler

The illustration shows a design of wet-pulp sampler which is actuated by a mechanism directly connected with a contrivance similar to a certain type of water or solution gage. The sampler possesses some features not found in the usual type of water-actuated machine. Mention is made of the apparatus in Bulletin 164 of the Institution of Mining and Metallurgy; and the drawing and data appear in connection with a report made by the Cornish Subcommittee of the Tin and Tungsten Research Committee.

It was necessary to select a sampler in which confidence could be placed. Accordingly, preliminary experiments were made on a portion of the pulp stream to ascertain: (1) The relative merits of different slot movements, and whether the slot should move horizontally and parallel with the axis of the stream or at right angles to it and down through it; (2) the solid-to-liquid ratio of the sample taken; (3) the solid-to-liquid ratio of the whole of the pulp flowing.

Two similar slot samplers were fixed to take the pulp stream in series, one moving horizontally and parallel with the axis of the stream, the other moving at right angles to it and down through it. For a period of 45 min., while the samplers were working, the whole of the pulp passing was collected in a large receptacle, evaporated, dried, and sampled.

Being satisfied that the horizontally moving sampler fulfilled the requirements, the committee had three of these made for sampling the pulp, and a larger one for sampling the effluent from the mill. Three samplers of this pattern and size were arranged to work in unison by being attached at the required distance to a long rod moving on roller guides in front of the three batteries, to which rod a reciprocating motion was given by a tippler, actuated by water. The oscillation of the tippler caused the samplers to cut their respective pulp streams at the same moment, the interval between successive cuts being governed by the rate of flow of water into the tippler.

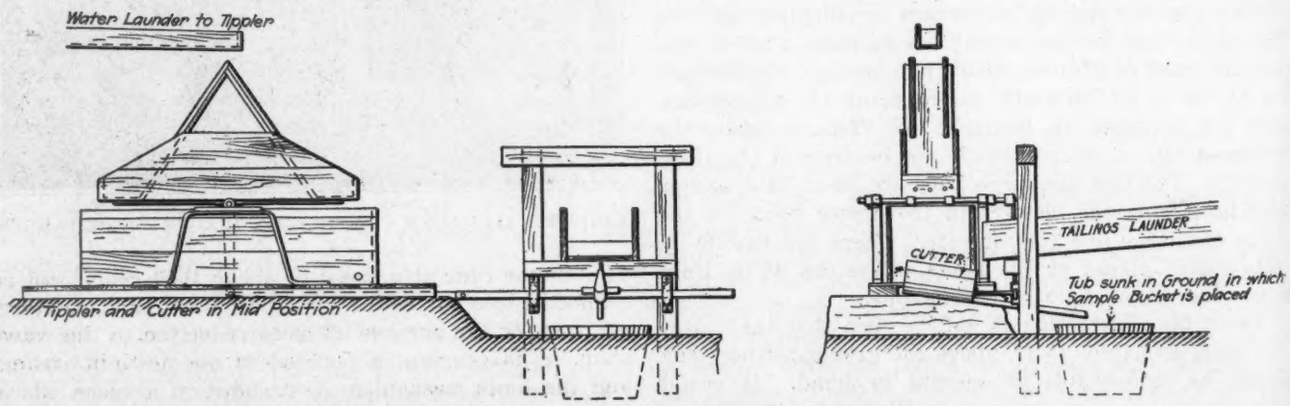
The three samplers having been fixed in position in front of the mill, a preliminary trial run was made to ascertain: (1) The number of cuts per hour required to produce a pail full of pulp per day from each battery; (2) to establish the solid-to-liquid ratio of each sample in (1). The results of the trial are shown in the accompanying table.

DETAILS OF OPERATION OF AUTOMATIC SAMPLER

No. of Battery	Pattern of 10-Stamp Battery	Length of Run in Hours	No. of Cuts	Pulp — Dry Solids	Pulp — Water	Pulp — Total	Solid-Liquid Ratio	Remarks
1	Holman	4	60	456.5	2435.5	2892	1/5.3	.....
2	Holman	4	60	478.0	2694.0	3172	1/5.6	New shoes
3	Harvey	4	60	553.5	2588.5	3142	1/4.6	.....

Note 1.—Batteries No. 1 and No. 2 are of 1050-lb. stamps; Battery No. 3 is of 1250-lb. stamps.
Note 2.—The mill foreman states that the weights are practically in proportion to the duties.

The figures in the table showing the amount of dry solids taken by each sampler, being closely in accord with the relation of the stamp weights, justified the decision to add together the whole of the pulp obtained in each of the three pails to form the daily sample of the mill pulp.


Water Launder to Tippler
Tippler and Cutter in Mid Position
TAILINGS LAUNDER
CUTTER
Tub sunk in Ground in which Sample Bucket is placed

METHOD OF OPERATING ORE-PULP SAMPLER

In the preliminary trial the number of cuts per hour was 15, but it was decided to increase this to 20 for the final test. All tailings or effluent from the various parts of the mill left it in one main stream, except a small quantity of overflow water which was pumped back for dressing purposes. This latter was measured and its fine suspended material assayed. The result, affecting the assay value of the main effluent by only 0.05 lb. of Sn per ton, was considered negligible.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Agreement Reached on Oil-Lands Bill

After years of consideration, the House and the Senate conferees have agreed upon a measure "to encourage and promote the mining of coal, phosphate, oil, gas, and sodium on the public domain." The House, after some discussion, accepted the conference report upon this, the Oil-Lands Leasing Bill. So far as oil, sodium, and phosphate are concerned, the bill provides for leasing. In the case of coal, however, there is a sale provision as well.

The conference report brought out an acrimonious discussion in the Senate. Senator Smoot was the chief opponent to its acceptance. Senator Pittman, in submitting the conference report, spoke as follows with regard to the oil feature of the measure:

> The Senate, in dealing with the oil situation, did not disturb that portion of the public domain which was reserved for the benefit of the Navy. The Secretary of the Navy and the Secretary of the Interior reserve certain of the public lands which were supposed to carry or did carry oil, for the use and benefit of the Navy. In our bill providing for the leasing of oil lands we eliminated all that land. The House, however, incorporated in its bill a provision for the development of those Navy reserves. The provision in the House bill was that the claimant of an oil well or, rather, the claimant of a mining claim under existing law who had developed an oil well that was producing, should have the right, upon the surrender of all claim of title to the mining claim under existing law, to a lease of the well.
>
> That provision was drawn by the Secretary of the Navy, the Attorney General, and the Secretary of the Interior. We adopted that in toto. In other words, as far as the Navy reserves were concerned, we have adopted everything that the Department of the Navy, the Interior Department, and the Department of Justice have asked us to adopt. As far as the Navy reserves are concerned, we reached a compromise. The House bill provided that, outside naval oil reserves, where a man had developed an oil well in good faith, without fraud, upon the public domain, under the belief that he was doing it under existing law, he should have a right to a lease on the claim, provided he surrendered all claim of title, at a royalty of not less than one-eighth, to be fixed by the Secretary of the Interior, both as to past royalty and as to future royalty. . . . The Senate bill provided expressly that the royalty should be a fixed amount, one-eighth, as to past production and future production. The compromise was that as to past production, which had probably been expended in the form of dividends or costs of new developments, there should be a fixed royalty of one-eighth, and as to the future royalties under the lease it should be not less than one-eighth and as much more as the Secretary of the Interior should state. That was the compromise and that is the bill of the conferees.

Protection for Manganese Unlikely

Efforts to continue the domestic production of manganese will not be encouraged by the Government, it is understood. The more promising reserves of this material offer only one year's supply. Additional reserves contain another year's requirements, but it is felt that these should be let alone for a possible emergency. Of course it would be impossible to make these reserves available in two years' time. The matter has been looked into by the Tariff Commission, and it is regarded as unlikely that any effort will be made to secure tariff protection for the domestic manganese industry.

The U. S. Geological Survey and the engineers cooperating with it have examined 1200 manganese deposits since the beginning of the war. At the crest of domestic production, there were 225 properties on a shipping basis. There are now 40 operations still doing work, but they are being kept alive by old contracts in practically every case.

The new contract arranged recently for Arkansas ore shows clearly, it is held, that the consumers will so penalize the siliceous ores as to leave no chance for their profitable production.

Disposal of Nitrate Stocks

The Federal Government has a surplus of 226,000 tons of sodium nitrate in the United States and 120,000 tons in Chile. An arrangement has been perfected between the director of sales for the War Department and American importers whereby the latter agree to dispose of the surplus in this country, the Government undertaking to sell to foreign interests the stocks held in South America. The importers who will have the responsibility for the sale of the surplus are held out of the primary market for shipment to the United States pending the distribution and sale of this surplus, or until import restrictions are removed by the signing of peace. The decision in this connection was reached at a conference between the director of sales, the nitrate committee, and representatives of the War Trade and War Industries boards.

Potash Bill Amended

After hearing the representatives of domestic producers of potash, the Senate Committee on Mines and Mining amended Senator Henderson's bill in some particulars and reported it favorably to the Senate. Every effort is being made to secure its consideration at this session of Congress, but it is regarded as improbable that the measure can be acted upon. The important amendment to the bill qualified the licensing provision so that, for the first 12 months after the peace treaty is signed, the maximum price of potash shall not exceed $2.50 per unit of 20 lb., and for the succeeding 12 months it shall not exceed $2 per unit. Another amendment provides that not more than one-third of the appropriation of $150,000 is to be expended in any fiscal year.

The disposition on the part of the House not to accept the war-minerals section of the validation of contracts bill made it appear, on Feb. 24, that a further change in the section would be made. It is probable that the House will be willing to accept the section if it is limited to chrome, pyrites, manganese, and graphite, and $8,000,000 is specified as the maximum amount which may be devoted to the awards.

American Institute of Mining and Metallurgical Engineers

Concluding sessions of the 119th meeting of the American Institute of Mining and Metallurgical Engineers were marked by papers of much interest and by lively discussions. Social functions were terminated by the annual banquet at the Biltmore Hotel and a visit on Thursday, Feb. 20, to the Federal shipbuilding plant at Newark, New Jersey.

SESSIONS held on the first two days of the annual meeting of the Institute were briefly reported in the last issue of the *Journal*. The presentation of technical papers was concluded on Feb. 19. At the session of mining, milling, and geology, held on that date, interest was focused on three papers dealing with the coal situation.

R. V. Norris stated that an increase of 75c. a ton on anthracite would be allowed by the Government in the near future. He said that from 30 to 35% of the anthracite mining companies are now operating at a loss.

S. D. Warriner stated that what the Government calls regulation is in reality restriction of the law of supply and demand. The coal situation is worse than it has been painted, he asserted, and more than 60% of the anthracite coal now being sent to the market is sold at a loss. The public will have to take notice, he said, of the fact that the average annual production of the anthracite mines is below normal.

Edwin Ludlow said that although the Government had allowed the operators $1,500,000 extra on some sizes, wage increases for the same period amounted to $3,000,000. He said that labor conditions in the mines are now unfavorable to increased production, using the argument that increased wages tend to lessen the energy of the workers.

An Interesting Moving-Picture Show

Moving pictures showing operations at the New Cornelia Mining Co.'s plant, mining operations of the Utah Copper Co., of the Nevada Consolidated Copper Co., milling operations of the Utah Copper Co., and smelting operations of the Garfield Smelting Co. were shown on Feb. 19 during the afternoon. The pictures were taken by the U. S. Bureau of Mines, with the coöperation of the various companies. The Eureka Pit, at Ely, Nev., and the Liberty Pit, of the Nevada Consolidated, were shown in a striking manner. Panoramas of the McGill smeltery and town site, of the Arthur and Magna concentrators, and of the Garfield smeltery were thrown on the screen. Operations at the mines at Bingham Canyon and Ely, Nev., involving drilling, bank shooting, and blasting out ore, were shown in detail, and the method of loading the overburden by steam shovels into cars and dumping was also depicted. Drilling holes with a churn drill, which was transferred by being loaded onto a car by a locomotive crane, was also illustrated, as was the blasting of boulders in the way of the steam shovel, having first provided portable safety houses for protection of the men from flying debris.

Unloading ore from cars into bins at the Arthur and Magna concentrators was illustrated on the screen, as well as the feeding of the ore on coarse grizzlies, pan conveyors, crusher rolls, Impact Screens, and Garfield tables.

Annual Dinner at the Biltmore

The annual banquet was held at the Biltmore Hotel on Feb. 19 and was well attended. Only three speakers were announced on the program, which was a change from previous years. Lawrence Addicks, presiding, before introducing the speakers, took occasion to commend the ladies for their part in war work, referring to them as "companions in arms." The first speaker was D. B. Dowling, president of the Canadian Institute of Mining Engineers, who expressed his desire to return the warm welcome he and his comrades received on their visit to this meeting. He stated that instead of Canada being known as the "Lady of the Snows," it should be designated the "Lady of the Warm Heart," as far as members of the American Institute were concerned. The speaker also hoped that through their allied efforts in the war, Canada and the United States will have attained feelings of mutual respect; which sentiment brought forth the cheers of the diners.

In introducing Sydney J. Jennings, president of the Institute during the last year, Mr. Addicks told the story of the hired man refusing to operate one of the new tractors on the market for hauling material, on the ground that he had required 20 years to understand a mule and it was too late in life to begin on a tractor. The same situation applied to understanding "farewell addresses" of outgoing presidents of the Institute, declared Mr. Addicks. He also stated that the Institute never enjoyed a more prosperous year than it did during Mr. Jennings' tenure of office.

The outgoing president opened his address by referring to the Colorado meeting last October, when he promised a warm welcome to Western members who would attend the next annual meeting. He also wished to extend the same welcome to members of the Canadian Institute, and told of the great advantage possessed by a city like New York for such a meeting of mining engineers. He defined a New Yorker as a man who, when he is not a southerner, is a New Englander who went west and came back to New York.

The speaker discussed many different activities of the organization during the last year. The membership of the Institute increased to 7700, the largest number by far recorded in its history. The goal to be attained, considering the advantages offered by the Institute, should be 14,000, inclusive of members, associates, and juniors.

The Institute had contributed generously toward winning the war, and of the 845 members who wore the uniform of the Allies, 23 died in service.

The president said that he had visited six of the 15 local sections during the year, and the secretary and C. W. Goodale, vice-president, had visited the others. Certain schisms were arising in the mining engineering profession, among which was a movement to form state mining societies, like trades unions, for the purpose of licensing engineers. The idea of raising the wages paid to engineers was laudable, the president maintained, but it was doubtful as to whether the method suggested was likely to achieve success. This therefore was the opportunity of the Engineering Council, the representative of all national engineering bodies, to focus the efforts of various organizations in this direction and help to bring the engineer before the public.

The change in name to that of American Institute of Mining and Metallurgical Engineers was welcomed by the speaker as being a step in the direction toward the inclusion of a larger number of men already interested in mining or in closely allied industries.

The papers presented during the session, especially those on what were termed "human" engineering, possessed extraordinary interest.

Chairman Addicks, in presenting Horace V. Winchell, the recently elected president, stated that the Institute had decided to elect the best mining geologist in the whole city of Minneapolis. However, the chairman continued in a humorous vein, the query arose that if a mining geologist cannot actually mine or develop a mine, what good is he? The answer to this is that, if you have a really good geologist, and he likes you, you can take him into court, and he will prove anything.

Mr. Winchell addressed the assemblage as "Fellow prospectors, ladies, and gentlemen," and stated that though he was familiar with the "apex" in a geological sense, he failed to appreciate the "apex of the vein" of humor of the chairman. He then made a strong plea to the assembled engineers to consider seriously the part they are called upon to take during the immediate future. Continuing, Mr. Winchell said in part:

"Though engineers can reflect with pride on the service they rendered during the recent conflict, it is not sufficient complacently to remember the past. The engineer should endeavor to get 100% efficiency out of himself and his organization. The factory, mine, and schools should provide subjects for careful consideration. The better we understand the world and its problems, the better we will be able to perform everything that concerns our own welfare. Formerly we needed foreign capital for development of our resources. Now the European nations owe us fabulous sums. This change in our status is of tremendous importance to the engineer.

"The first problem is the restoration of the devastated areas. The railroads and highways of the world are worn out and must be renewed. All this means an unprecedented effort for this country. Labor is in a condition of unrest and uncertainty which must be readjusted. This again demands the intelligence and study of engineers. Bolshevism is the antithesis of democracy. It is an abomination which is subversive of order and must be opposed by every influence which desires the welfare of mankind. The engineer is not alive to his possibilities. He is too retiring, too absorbed, and too much of a materialist. He should take part in every move for humanity, and should be a moral and educational force in every community. Efficiency stressed too much becomes an end in itself. Of the efficiency of the German people, Dr. Nicholas Murray Butler says: 'The war has taught a lesson. The proper place for efficiency is as the servant of a moral idea; otherwise it will attain only disaster.' Therefore efficiency should not be used solely for the material result obtained, often translated as tons per hour, but for the development of character.

"The education of engineers is too defective in economics, and the bad mining laws of the country are also the result of this lack of proper education. The engineer has a keen appreciation of this defect, but he is unable to provide remedies. He then becomes cynical when no remedies are provided by others. Engineers should develop the ability to make a simple analysis. They should develop pride of profession, pride of race, and pride of country."

Visit to the Shipbuilding Plant

On Thursday the members of the Institute and their friends visited the Federal Shipbuilding Co.'s plant at Newark, N. J. The party reached the plant in the forenoon and was divided into small groups, each under the leadership of one of the company's staff. The foundry, boiler, machine, and plate shops were visited in turn. All of the shops have been recently constructed, and they represent, both in building and equipment, the best that engineering experience can devise. The 12 shipways contained steel vessels in various stages of construction. One large cargo boat, in an almost completed condition, was inspected. The morning was all too short for such an extensive trip. The luncheon that completed the visit was an excellent and much appreciated testimonial to the courtesy and thoughtfulness of the shipbuilding company.

German Vandalism

The *Journal* has already drawn attention to the lamentable way in which the Germans maltreated the iron mines at Briey during their occupation of the territory in which the mines are situated. Additional information on the subject has been furnished by *Union Economique de L'Est*, from which it is learned that the Germans exploited the property by enlarging the stopes and by robbing the pillars protecting the roof, pillars which the French Mines Administration considered necessary, and which now are ruined in those workings wherein the Germans operated. Three disadvantages result from this exploitation of the pillars. In the first place, as they no longer are sufficiently strong; they must be strengthened by brick-walls, which are costly; or they will be crushed by the roof, and that would result in a big loss of ore. Second, the fall of the roof into the mine would bring about an increase in the inflow, as it would be impossible to build the supporting walls, which the destructive operations of the enemy have made necessary, quickly enough. Third, the falling of the roof would bring about subsidences of the surface, resulting in serious damage, especially when the regions thus exploited are situated under working plants, running water, railways, roads or villages.

Most of the steel works of the metallurgical plants were dismantled, robbed, and destroyed by the German bandits. The blast furnaces were not destroyed with the same ruthless thoroughness, but everywhere the blowers have been stolen. All the material and equipment have been carried to the plants in Alsace Lorraine, Luxembourg, and Germany, and part of it has already been found in the reconquered regions occupied by the French troops. This material lies, for the most part, exposed to rain, dust, and oxidation. The thieves had no time to use it; but, in any case, their aim was, above all, to ruin France.

The plants of the Acieries de Longwy, at Longwy, and of the Société de la Providence, at Rehon, can be considered as almost completely destroyed. Everything, or almost everything, must be rebuilt. The works of La Chiers have sustained comparatively little harm. The blast furnaces and the steel works were damaged only slightly, but all the rolling mills were dismantled.

The plant of the Société Metallurgique de Senelle-maubeuge, is almost untouched. The blast furnaces, the mixer, the converters, the Thomas steel works and the blooming mills were only slightly damaged. The machinery of the rolling mills was, however, taken away; but the company knows the German factory in which it was placed. This plant will be able to resume operations in three or four months' time, with a monthly production of about 20,000 tons of raw products.

As for the plant of the Société Villerupt Laval-Dieu, which was bought over by the Senelle-maubeuge in 1913, the Villerupt blast furnaces are in bad condition and look as if they could never be used again, but, by way of compensation, the rolling mills and the Martin furnaces at Laval-Dieu are intact. The Germans used them as a workshop for important repairs, and the furnaces were still warm when the Allied troops arrived.

Adjustment of Mexican Finances

Following a number of informal conferences by representatives of American, British, and French governments in Paris, the appointment of an international commission was made recently for the purpose of adjusting and stabilizing financial affairs in Mexico, thereby protecting the interests of foreign investors and making it possible for the Carranza government to secure the funds necessary for the rehabilitation of the country.

The committee consists of ten American, five British and five French bankers. T. W. Lamont is to act as chairman. Other American members are: J. P. Morgan, John J. Mitchell, Walter T. Rosen, Charles H. Sabin, Mortimer L. Schiff, James A. Stillman, James N. Wallace, Albert H. Wiggin, and Robert Winsor. The following men have been appointed as alternates for the American members: John H. Fulton, Benjamin S. Guinness, Jerome J. Hanauer, E. D. Hulbert, Frank W. Remick, Francis H. Sisson, Edward R. Tinker, and J. Y. G. Walker.

Though no definite program of procedure has yet been announced by the committee, in general its functions will be to inform itself as fully as possible as to existing conditions in Mexico, with a view to such positive action as may be taken whenever circumstances permit.

New Date Set for 27th's Return

According to our latest news from the 27th Engineers, cabled by Colonel Perry this week, it is expected that the regiment will embark for home on Mar. 5. There have been disappointments during the last two months of waiting, but some confidence in the new date seems to be indicated.

The disappointment is as keen on this side as it must be on the other. Let there be no similar disappointing of the men in the welcome they receive on their return. They are coming back hoping for the old acquaintances and the old surroundings, and it may safely be said that the welcome awaiting them will be more appreciated if they are assured that their old employment, or better, awaits them when the shouting is over.

HOW THE COMFORT FUND STANDS

Receipts to Jan. 1, 1919, including interest	$19,745.21
Alaska Mining and Engineering Society	111.00
W. H. Corbould	6.50
Dover Laboratory	2.00
W. L. Strauss	10.00
Employees Braden Copper Co., Chile	34.00
W. C. J. Bartels	20.00
January interest	15.75
H. V. Maxwell	5.00
Leonard Loehr	5.00
Carl J. Trauerman (second contribution)	5.00
Carl Tombo	6.00
Total	$19,965.46

Checks should be made payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Chile Copper Company

The seventh quarterly report of the Chile Copper Co., covering the third quarter of 1918, shows that copper production was 23,398,490 lb., as compared with 24,556,156 lb. for the quarter ended June 30, 1918. Total ore treated was 968,115 dry tons, averaging 1.60% copper, as compared with 950,885 tons, of 1.58% copper, during the second quarter. Net copper recovery was 81.72 per cent.

The following costs and profits are stated on the basis of copper sold and actually delivered, the undelivered copper being carried in the inventory at cost:

	Third Quarter 1918, Per Lb.	Second Quarter 1918, Per Lb.
Cost of production, exclusive of excess-profits tax, and obsolescence	18.30c.	17.73c.
Cost f.o.b. plant, including depreciation	11.94c	11.28c.
Cost of delivering, including freights, handling, selling, miscellaneous expenses, and income taxes, with credits for miscellaneous earnings	2.87c.	2.59c.
Depletion of ore reserves, interest and amortization of bond discount	3.49c.	3.86c.

The following tabulation shows the financial outcome of the operations of both the Chile Exploration Co and the Chile Copper Co. for the third quarter of 1918, compared with the results for the preceding quarter:

	Third Quarter 1918	Second Quarter 1918
Net profit on copper delivered (after deducting depreciation)	$3,276,944.84	$2,006,671.35
Miscellaneous income	46,091.06	68,878.36
Interest on call loans and bank balances of the Chile Copper Co.	78,181.35	15,634.96
Total income	$3,401,217.25	$2,091,184.67
Amortized discount on 15-year 6% convertible bonds	35,000.00	35,000.00
Accrued bond interest of Chile Copper Co.	660,008.26	572,788.58
Expenses of Chile Copper Co.	4,578.54	37,648.53
Balance undivided profits—both companies	$2,701,630.45	$1,445,747.56

The above earnings are computed on the basis of 25.48c. per lb. of copper delivered during the quarter, compared with 23.69c. per lb. delivered during the preceding quarter.

Editorials

Russia

WE GIVE a great deal of space this week to the subject of Russia, for two principal reasons: (1) the Russian problem comes pretty near to being the most important of all problems at the present time; (2) Leslie Urquhart, a distinguished British mining engineer and administrator of mines, is recognized among his professional colleagues as the leading authority on the Russian problem. We think we may say that he has attained general recognition in Great Britain to the same effect. As the head of the great Anglo-Russian mining and metallurgical enterprises in Siberia, as an engineer and administrator who has been accustomed to close observation and accurate deduction, as one who has recently been in Russia on a prolonged visit for the purpose of looking after the affairs of his companies, there is scarcely anyone who is better qualified to speak about conditions there and to forecast the prospects.

It is amazing that the statesmen and politicians who are trying to arrange the terms of peace in Paris should be so blind to the situation in Russia and what needs to be done there. What is the use of arranging a League of Nations if Russia is going to be left helpless and subject to the exploitation of Germany? In that great country, with its marvelous natural resources, Germany would find the opportunities that the United States had in the Great West after the Civil War.

The idea of separating Germany and Russia by a line of buffer states is a doubtful expedient. Mr. Urquhart expects to see the Ukraine, the Baltic provinces, and other parts of the former empire gravitate back to Great Russia. Inevitably will they do so, for the same economic reasons that made them come together in the past will keep them from remaining apart in the future. We are inclined to go further in expecting to see the return of Poland and Lithuania, which will have difficulty in preserving any economic independence. They must draw either to Germany or to Russia, and will naturally lean to the latter, with which they are kin. Even so with Finland, although there is no kinship.

America and Great Britain should lend a helping hand to those loyal, humiliated Russians who are endeavoring to recover their country from the clutches of the Bolsheviki, who have created such a hideous disaster.

Federal Income Tax Law

ON FEB. 6 the Conference Committee reported to the Senate and to the House the largest tax bill of history. It may be recalled that during 1917 and 1918 there was considerable discussion in regard to the intent of certain sections of the earlier laws, and that an important ruling was rendered by the Treasury Department under date of Feb. 7, 1917, in respect to depreciation and depletion to be allowed in the case of mines. In this connection it will be of interest to compare the paragraphs on this subject under "Deductions Allowed" as they appear in the amended bill of October, 1917, and in the present conference bill:

Federal Income Tax Law, enacted Sept. 8, 1916, as amended by the acts of Mar. 3, 1917, and Oct. 3, 1917. Part I—On individuals. Deductions allowed. Sec. 5, Par. 8: "(a) In the case of oil and gas wells a reasonable allowance for actual reduction in flow and production to be ascertained not by the flush flow, but by the settled production or regular flow; (b) in the case of mines a reasonable allowance for depletion thereof not to exceed the market value in the mine of the product thereof, which has been mined and sold during the year for which the return and computation are made, such reasonable allowance to be made in the case of both (a) and (b) under rules and regulations to be prescribed by the Secretary of the Treasury: Provided, That when the allowance authorized in (a) and (b) shall equal the capital originally invested, or in case of purchase made prior to Mar. 1, 1913, the fair market value as of that date, no further allowance shall be made. No deduction shall be allowed for any amount paid out for new buildings, permanent improvements, or betterments, made to increase the value of the property or estate, and no deduction shall be made for any amount of expense of restoring property or making good the exhaustion thereof for which an allowance is or has been made."

Conference Bill. Title II—Income Tax. Part II—Individuals. Deductions allowed. Sec. 214: "(10) In the case of mines, oil and gas wells, other natural deposits, and timber, a reasonable allowance for depletion and for depreciation of improvements, according to the peculiar conditions in each case, based upon cost including cost of development not otherwise deducted: Provided, That in the case of such properties acquired prior to Mar. 1, 1913, the fair market value of the property (or the taxpayer's interest therein) on that date shall be taken in lieu of cost up to that date: Provided further, That in the case of mines, oil and gas wells, discovered by the taxpayer, on or after Mar. 1, 1913, and not acquired as the result of purchase of a proven tract or lease, where the fair market value of the property is materially disproportionate to the cost, the depletion allowance shall be based upon the fair market value of the property at the date of the discovery, or within 30 days thereafter; such reasonable allowance in all the above cases to be made under rules and regulations to be prescribed by the Commissioner with the approval of the Secretary. In the case of leases the deductions allowed by this paragraph shall be equitably apportioned between the lessor and lessee."

In respect to the depletion of mine and oil properties it is evident that the present bill attempts to simplify without altering the intent of the earlier bill. The wording is somewhat different, but the opinions and rulings of the department made during 1917 and 1918 will undoubtedly apply without the necessity of review and modification.

The provision for the valuation of a mining property discovered since Mar. 1, 1913, namely, that it "shall be based upon a fair market value of the property at the date of discovery, or within 30 days thereafter," may be eminently fair in its intent toward the discoverer or owner of the property, but its application will admit of various and sundry conclusions. Especially is this true when the department's ruling of Feb. 7, 1917, is taken into consideration. One sentence of that ruling reads: "Neither must the value determined as of Mar. 1, 1913, be speculative, but must be determined upon the basis of the salable value en bloc. . . ."

The value of a discovery from a prospector's point of view is often a large sum and does not appreciably di-

minish in the course of 30 days. From the purchaser's point of view, a prospect is more likely to be considered a liability than an asset of value, and seldom is it considered worth much more than a grubstake.

We have no solution for the vexatious problem of determining the salable value of a prospect, especially when the problem is complicated by the fact that, in practice, prospective value is an essential factor in its solution, whereas, by law, prospective value must not be taken into consideration.

The Treasury Department has, however, shown justice in its interpretation of the law during the last year; and we scarcely expect serious conflict upon this point in the future when a serious attempt is made to reach an equitable valuation for depletion and tax purposes.

The Engineer in Politics

ONE of our distinguished public officials has rightly said that every matter of interest was a political matter. Sooner or later every subject that attracts public attention gets into politics in some form or other, and it is right that it should. In our form of government, political parties make laws and enforce them; they provide or arrange for public utilities and many of our private necessities; they largely regulate the lives of the people. When we say that certain subjects must be removed from the field of politics we do not mean the advice to be taken literally. It is the baneful effects of politics that are harmful. If a man is in the civil service he occupies his position continuously because of a law passed by some political party when in power. Our public-school system, which we cherish because it is far removed from the field of politics, is superior to that of some other states because it was not sponsored by a political party.

But what has all this to do with mining engineers? Just this: Engineers—mining engineers no more, no less, than other engineers—are unquestionably entitled to take a prominent part in all public affairs. The capable engineer is not gifted with any special intuition, but, no matter how strange the subject and if given time and opportunity, he knows how, and will be able, to get at its principles and details. With these in mind he is able to create and construct, to stimulate human effort, and to accomplish.

For some unaccountable reason, and in spite of being well equipped, the engineer is prone to take but little interest in public affairs; and there is no doubt that he is shirking his civic duty by remaining in the background. Several of our prominent engineering societies have maintained for years that it was improper for such organizations to express views on public or political questions officially. If they insist on taking that attitude, the public cannot be criticised for regarding their members as a collection of "high-brow" incompetents.

There was never a time when our Government and the public were in greater need of the careful guiding thought of such men as are in the engineering profession. The Government does not appreciate and the public does not know what engineers can do, and so neither asks for help from them. We let our special talents be known to a few who may have use for them. We take our pay, and feel that we have done something useful. But we have a broader field in which to work—one where our work will not be measured in dollars and cents; possibly not even in gratitude. Our pay, if we realize any, will be only in the consciousness of something done that was worth while.

It is our duty to take an active interest in public affairs, to get into politics and make our presence felt. If our political system is dirty, we have no business to wash our hands of it until we have done our best to remedy this deplorable situation. Far from being unethical and unprofessional, it is our privilege and our duty, both in the aggregate and as individuals, to let our light so shine that it may be seen of men.

Salvage of War Equipment

REDISTRIBUTION and economic use of the immense stocks of supplies and equipment now in Government hands form a problem, or many problems, of serious moment. We have already pointed out that the Government ought to use great care and judgment in disposing of its stores of metals, so that their distribution may not unduly interfere with normal production and trade.

A suggestion has been made, in the form of a bill recently introduced into Congress by Representative Caldwell, of New York, authorizing the Secretary of War to lend to such educational institutions as may be able to use them, machine tools suitable for their purpose. It is estimated that the Government, through its war activities, has come into possession of machine tools to the value of $200,000,000 to $300,000,000. Some of these pieces will remain in service in the arsenals, and some will be absorbed into normal manufacturing enterprises, but the great majority must be either stored or scrapped.

There is scarcely a school that is attempting to give manual or technical training that could not use some pieces of this machinery to advantage. It has been paid for, it has served its primary purpose, and now, if an additional use may be found for it other than as scrap, all of the American people will be gainers.

We would not advocate the establishment of new trade schools in order to conserve machinery—there are already too many struggling for existence under financial handicaps. But we most emphatically support the plan of loaning or giving to the established institutions, under proper restrictions, such material as they want and can use to advantage. Such action will relieve the Government of what might constitute wanton destruction, and it will supply some of the schools with badly needed equipment of standard pattern, but, above all, it will give to additional hundreds an opportunity of acquiring mechanical skill.

Whether our boys are to become tradesmen, farmers, miners, mechanics, or what not, a certain amount of mechanical training will not be wasted. The tradesman runs his truck; the farmer now uses steam power, electricity, and gasoline; the miner handles all sorts of machines—in short, we are living in a mechanical age, and a man who cannot handle the simple tools is, or ought to be, the exception.

There is in this suggestion a point of some importance in addition to that of helping the boys. These machines will only be loaned. If an emergency arises, they will immediately be restored to the Government, and, in the meantime, there will have been trained a

large number of men who can use them. In other words, we have in this proposal a practical phase of preparedness.

We hope that our representatives at Washington will see the wisdom of the plan proposed by Mr. Caldwell, that the authorization asked will be granted, and that every school in position to make use of the equipment will ask for and get it.

BY THE WAY

George Graham Rice, a poet of surpassing imagination when it comes to promoting oil and other stocks that are warranted to make purchasers wealthy even faster than a grand jury can return indictments, was adjudged insolvent by Judge Martin T. Manton of the Federal District Court, Feb. 3, in the face of his claim that he had "Rice oil stocks" of great value. According to the Federal authorities, Rice's liabilities exceed $700,000, though he asserts he has assets consisting of outstanding accounts worth $237,000, stocks and other securities to the value of $200,000, and the aforesaid oil stocks. Two indictments for grand larceny against Rice were found by the Grand Jury last July, two days after he was arrested by Federal agents on a charge of using the mails to defraud.

The writer of "Grub Stakes and Millions," published in *Harper's Monthly* of February, 1880, gives an excellent example of how some would-be social reformers get their dope. He says, in part: "At a certain depth . . . you stop at side drifts or cross-cuttings in which men are at work, and here you see, walled in by rock, the fissure vein. Some are 'stoping,' or cutting pieces away with the pick; others holding the steel wedges, and others striking them tremendous blows with sledge-hammers. They are, by-the-way, in the habit of accompanying these blows with guttural sounds, the hearing of which induced a special correspondent of the gentler sex—ignoring the fact that they receive three dollars per diem, own chronometer watches, and have fine bank accounts, and silver spoons on their tables—to write a soul-moving description of the poor down-trodden miner, imprisoned far from the light of the blessed day, uttering terrible groans as he toiled his life away for the enrichment of the bloated and pampered capitalist."

Cap'n Dick was keeping cases on the new compressor and was apparently well satisfied with its performance. "M'son, it do my 'eart good to see 'er gaw. There she stan's, twenty-four 'ours in tha day, a-workin' forth an' back an' blawin' like some bloody gert creature. An' 'ow do tha men like un? W'y, dam-me, son, never a word o' complaint 'as I 'eard. Only one time 'as I ever 'eard kickin' 'aout men 'avin' too much h'air. Nummer o' years h'ago Dicky Broad, 'e wuz tribbitin' to Dolrand mine, an' Sundays 'e wuz pumpin' church h'organ. One day 'long come one o' these 'ere chaps w'ot 'ad a wonnerful touch on tha h'organ, so rector 'e h'asks 'im to play mornin' service. An' 'ow 'e could play, m'son. 'E'd start to one h'end o' tha bloody keys an' dash down to t'other, an' 'ere all tha time wuz Dicky in tha bellus-pit, a-workin' tha pump 'andle an' sweatin' sumthin' h'awful. After service, Dicky 'e come h'out, an' walkin' h'up to this 'ere h'organ man 'e sez, 'Mister, I don't naw thee, but I tell 'e one thing—if th'art to play service tonight, thee can do as thee bloody well pleases, but I'm gawin' to blaw "H'abide Wi Me."' "

A compass is a handy thing to take along on one's travels, and it has been said that traveling broadens the mind. But some folks have the misfortune to be shunted back home before the broadening influence overcomes the single-track habit of thought. Sometimes domestic affairs cut short one's journeying; sometimes urgent business; and sometimes the loss of a job or the patent necessity of getting back on the job, lest it be taken away. Compasses are better guides than will-o'-the-wisps. Straws show which way the wind blows, to be sure; but winds are fickle, and even a patient camel may get Bolshevik notions when straws predominate. You can imbibe "Dutch courage" through straws, but the wisdom of travelers owes more to the compass. The compass of Cristoforo Colombo showed the way westward. Some compasses have the "W" on one side and others have the "W" on the other side. All English and American ships have the "W" invariably on the same side. An engineer's compass usually has the "W" on the right side. In French and in Spanish, the "W" is generally "O." The worthy gentlemen who traveled with Cristoforo Colombo were justified in worrying to a certain extent when they observed a variation in the relation of the magnetic needle to the pole star, after a considerable change in longitude. In modern times mariners can keep pretty close to a course, unless dodging torpedoes, mines, or an effeminate book published every year or so that gives the latest news on the magnetic variation at different points. But local attraction is the cause of many people fooling themselves, chiefly by ignoring the effects of local attraction. A good surveyor can do fair work with a needle, even where the local attraction is erratic; simply taking backsights and studying out the correct bearings. But some folks consider themselves superior to looking over the fields of local attraction, remarking that it is not necessary. In the case of the eminent consulting engineer who took observations at intervals with his Brunton compass, commenting later on the remarkably straight course steered by the officers of the P. & O. steamer from Key West to Havana, one may suspect a humorous evasion of local attraction. But the first prize for solid ivory should be awarded to a graduate mining engineer who sharply criticized some surveying work done by a French engineer in Peru, saying that Monsieur J. had entirely balled up the location of some mining claims by getting directions totally reversed; simply due to the fact that he failed to remember the well-known principle that the weighted end of the magnetic needle always points toward the most distant pole. When drinks were ordered in appreciation of the joke, this partly traveled person persisted that he was in deadly earnest; making no concessions until asked where in thunder the fool needle would point when exactly equidistant from the poles—terrestrial, magnetic, or barber's, as the case might be. How many readers of the *Journal* can tell, off hand, the answer to this question?

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over any order in coupons if so requested.

COPPER

10503—ALASKA—Mining Copper at Kennecott, Alaska. (Min. and Sci. Press, Jan. 11, 1919; 7½ pp., illus.) 20c.

10504—ARIZONA—Mining Methods of United Verde Extension Mining Co. Chas. A. Mitke. (Bull. 145, A. I. M. E., Jan., 1919; 13 pp., illus.)

10505—BRITISH COLUMBIA—Indian River Copper Deposits, Vancouver Mining Division. Charles Camsell. (Can. Dept. of Mines, Geol. Surv., Summary Report, 1917, Part B, 1918; 2½ pp.)

10506—CENTRAL STATES—Silver, Copper, Lead, and Zinc in the Central States in 1917. J. P. Dunlop and B. S. Butler. (Mineral Resources of the U. S., 1917—Part I; 58 pp.)

10507—COPPER—Gold, Silver, Copper, Lead and Zinc in Utah in 1917. V. C. Heikes. (Mineral Resources of the U. S., 1917—Part I; 36 pp.)

10508—CUPRO-NICKEL; an Examination of Its Physical Properties and Structure. T. H. A. Eastick. (Metal Ind., Jan., 1919; 3 pp., illus.)

10508a—FINANCE—Anaconda Copper Mining Company. (Eng. and Min. Journ., Feb. 1, 1919; 2 pp.) 20c.

10509—METALLURGY—Volatilization of Cuprous Chloride on Melting Copper Containing Chlorine. S. Skowronski and K. W. McComas. (Bull. 146, A. I. M. E., Feb., 1919; 11 pp., illus.)

10510—PURE COPPER—The Effect of Progressive Cold Work Upon the Tensile Properties of Pure Copper. W. E. Alkins. (Advance copy, Inst. of Metals, Sept., 1918; 14 pp., illus.)

10511—QUEENSLAND—Resources of the Cloncurry Copper Field—I. S. Harris. (Chem. Eng. and Min. Rev., Nov. 5, 1918; 4 pp., illus.)

10512—UTAH COPPER ENTERPRISE. IX, The Smelting of the Concentrate. T. A. Rickard. (Min. and Sci. Press, Dec. 28, 1918; 8 pp., illus.) 20c.

GOLD AND SILVER GEOLOGY

10513—NEVADA—Geology and Ore Deposits of the Yerington District, Nevada. Adolph Knopf. (Prof. Paper 114, U. S. Geol. Surv.; 68 pp., illus.)

10514—BRITISH COLUMBIA—Investigations in the Slocan District, B. C. M. F. Bancroft. (Can. Dept. of Mines, Geol. Surv., Summary Report, 1917, Part B, 1918; 13 pp.)

GOLD AND SILVER—GENERAL

10515—CENTRAL STATES—Silver, Copper, Lead, and Zinc in the Central States in 1917. J. P. Dunlop and B. S. Butler. (Mineral Resources of the U. S., 1917—Part I; 58 pp.)

10516—GRAPHICS of Gold and Silver. M. W. von Bernewitz. (Min. and Sci. Press, Feb. 15, 1919; 1 p., illus.) 20c.

10517—MILL—The New Mill of the Elkoro Mines Company. Henry Hanson. (Salt Lake Mining Rev., Jan. 30, 1919; 2½ pp., illus.) 20c.

10518—UTAH—Gold, Silver, Copper, Lead and Zinc in Utah in 1917. V. C. Heikes. (Mineral Resources of the U. S., 1917—Part I; 36 pp.)

GOLD AND SILVER—CYANIDING

10519—PRECIPITATION—Effect of Oxygen upon the Precipitation of Metals from Cyanide Solutions. (Bull. 145, A. I. M. E., Jan., 1919; 2 pp.) Discussion of paper of T. B. Crowe.

10520—TAILINGS—The Process and Plant of the Dayton Placer Recovery. George T. Hansen. (Salt Lake Min. Rev., Jan. 15, 1919; 2 pp., illus.) 20c.

IRON AND STEEL—METALLURGY

10521—ALLOY STEEL—Effect of Rate of Temperature Change on Transformations in Alloy Steel. H. Scott. (Bull. 146, A. I. M. E., Feb., 1919; 11 pp., illus.)

10522—BLAST FURNACES—Etude sur Les Hauts Fourneaux, d'Apres les Travaux de Francis Mulet. M. Damour. (Bull. de la Soc. de l'Ind. Minerale, 3 Livr., 1918; 47 pp., illus.)

10523—BLAST-FURNACE GAS—Remarques Relatives a la Composition des Gaz de Haut Fourneau et Methodes Volumetriques Pour le Calcul du Gaz Produit et du Vent Souffle. J. Seigle. (Bull. de la Soc. de l'Ind. Minerale, 3 Livr., 1918; 19 pp., illus.)

10524—BLAST FURNACE SLAG—Widening Demand for Blast-Furnace Slag. Clarence E. Wright. (Iron Age, Jan. 23, 1919; 2½ pp., illus.)

10525—ELECTRIC FURNACE—Developments in the Rennerfelt Furnace. H. A. De Fries and Jonas Hertenius. (Iron Age, Jan. 16, 1919; 1½ pp., illus.)

10526—ELECTRIC SMELTING OF IRON ORES—The Commercial Feasibility of the Electric Smelting of Iron Ores in British Columbia. Alfred Stansfield. (Bull. 2 B. C. Dept. of Mines, 1919; 95 pp.)

10527—FRANCE—Les Gisements de Fer de la Savoie. Albert Bordeaux. (Bull. de la Soc. de l'Ind. Minerale, 3 Livr., 1918; 17 pp., illus.)

10528—MANGANESE ALLOYS—Use of Manganese Alloys in Open-hearth Practice. Samuel L. Hoyt. (Bull. 146, A. I. M. E., Feb., 1919; 12 pp.)

10529—OXYGEN IN IRON AND STEEL—A Critical Study of the Ledebur Method for Determining Oxygen in Iron and Steel. J. R. Cain and Earl Pettijohn. (Tech. Paper No. 118, Bureau of Standards, Jan. 11, 1919; 33 pp., illus.)

10530—POTASH CONTENT of Blast Furnace Charges. N. H. Gellert. (Iron Age, Feb. 6, 1919; 1½ pp.)

10531—REFRACTORIES—Basic Refractories for the Open-hearth. J. Spotts McDowell and Raymond M. Howe. (Bull. 146, A. I. M. E.; 18 pp., illus.)

10532—RUST-PROOFING of Iron and Steel. Elmer S. Whittier. (Metal Ind., Feb., 1919; 3 pp.)

10533—SPECIFIC DENSITY OF STEEL—Does Forging Increase Specific Density of Steel? H. E. Doerr. (Bull. 145, A. I. M. E., Jan., 1919; 2½ pp., illus.)

LEAD AND ZINC

10534—ALLOYS—Recherches sur des Alliages Riches en Zinc Leon Guillet and Victor Bernard. (Rev. de Metallurgie, Sept.-Oct., 1918; 19 pp., illus.)

10535—CENTRAL STATES—Silver, Copper, Lead and Zinc in the Central States in 1917. J. P. Dunlop and B. S. Butler. (Mineral Resources of the U. S., 1917—Part I; 58 pp.)

10536—CONDENSATION of Zinc from Its Vapor. (Bull. 145, A. I. M. E., Jan., 1919; 1½ pp.) Discussion of paper of C. H. Fulton.

10537—ELECTROLYTIC DEPOSITION of Zinc. H. E. Broughton. (Chem. and Met. Eng., Feb. 15, 1919; 8 pp., illus.)

10538—FLOTATION—Treatment of Accumulated Tailing as Practiced by the Zinc Corporation. Geo. C. Klug. (Min. Mag., Dec., 1918; 3 pp., illus.) 40c.

10539—FLOTATION of Oxidized Ores of Lead. Glenn L. Allen. (Chem. and Met. Eng., Feb. 15, 1919; 7 pp., illus.)

10540—FOREIGN ZINC-SMELTING CAPACITIES and Prospects. W. R. Ingalls. (Eng. and Min. Journ., Feb. 1, 1919; 1 p.) 20c.

10541—MINING AND MILLING of Lead and Zinc Ores in the Missouri-Kansas-Oklahoma Zinc District. Clarence A. Wright. (Bull. 154, U. S. Bureau of Mines; 134 pp., illus.)

10542—UTAH—Gold, Silver, Copper, Lead and Zinc in Utah in 1917. V. C. Heikes. (Mineral Resources of the U. S., 1917—Part I; 36 pp.)

10543—UTAH—The Big Cottonwood Coalition Mines Co. C. E. Robertson. (Salt Lake Min. Rev., Jan. 30, 1919; 1½ pp., illus.) 20c.

OTHER METALS

10544—ALUMINUM—Annealing Cold-Rolled Aluminum Sheets by Abbreviated Exposures at Various Temperatures. Robert J. Anderson. (Advance copy, Inst. of Metals, Oct., 1918; 18 pp., illus.)

10545—ALUMINUM Industry in 1918; a Review of the Conditions Existing as to Supply and Demand of the Light Metal and Outlook for the Future. (Metal Ind., Jan., 1919; ¾ pp.)

10546—ALUMINUM: Its Use in the Motor Industry in England; the Application of the Metal in Replacing Steel and Other Metals. E. Carey Hill. (Metal Ind., Dec., 1918; 4 pp., illus.) 20c.

10547—ANTIMONY—A Bibliography on the Analysis of Antimony. (Elton R. Darling. (Chem. Eng., Jan., 1919; 2 pp.)

10548—CHROME—Brief on the Status of the Chrome Industry. Courtenay De Kalb. (Min. and Sci. Press, Jan. 4, 1919; 4¾ pp.) 20c.

10549—MAGNESIUM in 1917. Ralph W. Stone. (Mineral Resources of the U. S., 1917—Part I; 5 pp.)

10550—MANGANESE—Developing Arkansas Manganese. (Iron Tr. Rev., Jan. 30, 1919; 2⅔ pp., illus.)

10551—MANGANESE—Problems Involved in Concentration and Utilization of Domestic Low-grade Manganese Ore. Edmund Newton. (Bull. 146, A. I. M. E.; 10 pp.)

10552—MANGANESE—Use of Manganese Alloys in Open-hearth Practice. Samuel L. Hoyt. (Bull. 146, A. I. M. E., Feb., 1919; 12 pp.)

10553—MANGANESE in New Mexico. E. H. Wells. (Bull. 2, N. M. State School of Mines, 1918; 85 pp., illus.)

10554—MANGANESE Investigations in the Slocan District, B. C. M. F. Bancroft. (Can. Dept. of Mines, Geol. Surv., Summary Report, 1917, Part B, 1918; 13 pp.)

10555—NICKEL—Occurrence, Production, Treatment, Etc., with special reference to South Africa. T. G. Trevor. (So. Afr. Journ. of Ind., Nov., 1918; 10 pp.)

10556—TIN—Effect of Heating and Quenching Cornish Tin Ores Before Crushing. Arthur Yates; also discussion. (Bull. 170 and 171, I. M. M., Nov. 14 and Dec. 12, 1918; 4 pp.)

10557—TIN DEPOSITS in Nassarawa, Nigeria. W. E. Thomas. (Min. Mag., Nov., 1918; 3 pp., illus.) 40c.

10558—TUNGSTEN ORES—Experiments Relating to the Enrichment of Tungsten Ores. R. W. Gannett. (Econ. Geol., Jan.-Feb., 1919; 11 pp.)

NON-METALLIC MINERALS

10559—ASBESTOS—Shot Drilling Around Thetford Mines. J. W. Davis. (Can. Min. Journ., Jan. 22, 1919; 2 pp., illus.) 20c.

10560—BARITE Deposits of Missouri. W. A. Tarr. (Econ. Geol., Jan.-Feb., 1919; 22 pp., illus.)

10561—BRITISH COLUMBIA—Note on the Occurrence of Diatomaceous Earth, Clay, and Magnesite Along the Route of the Pacific Great Eastern Railway. Charles Camsell. (Can. Dept. of Mines, Geol. Surv., Summary Report, 1917, Part B, 1918; 3 pp.)

10562—EPSOMITE—Spotted Lakes of Epsomite in Washington and British Columbia. Olaf P. Jenkins. (From Vol. XLVI, Am. Journ. of Sci., Nov., 1918; 7 pp., illus.)

10563—FLUORSPAR AND CRYOLITE in 1917. Ernest F. Burchard. (Mineral Resources of the U. S., 1917—Part II; 13 pp.)

10564—GRAPHITE—Alabama Graphite in 1918. W. F. Prouty. (Eng. and Min. Journ., Jan. 25, 1919; 2 pp.) 20c.

10565—GRAPHITE INDUSTRY, The. Chas. Spearman. (Can. Min. Journ., Feb. 12, 1919; 1¾ pp.)

10566—LIMESTONES of Ontario. Howells Frechette. (Summary Report, Mines Branch of the Can. Dept. of Mines, 1917; 26 pp.)

10567—MAGNESITE—Basic Refractories for the Open-hearth. J. Spotts McDowell and Raymond M. Howe. (Bull. 146, A. I. M. E., Feb., 1919; 18 pp., illus.)

10568—NITRATE OF SODA in 1918. (Chem. Tr. Journ., Jan. 18, 1919; 1½ pp.)

10569—PHOSPHATE—A Geologic Reconnaissance for Phosphate and Coal in Southeastern Idaho and Western Wyoming. Alfred Reginald Schultz. (Bull. 680, U. S. Geol. Surv., 1918; 84 pp., illus.)

10570—RHODESIA—The Mineral Resources of Rhodesia. F. P. Mennell. (So. Afr. Journ. of Ind., Nov., 1918; 7 pp.)

10571—SALT—Notes of a Discovery of Rock Salt in Nova Scotia. L. Heber Cole. (Can. Min. Journ., Jan. 8, 1919; 2 pp., illus.) 20c.

10572—SILICATES—Les Siliciures Metalliques. Jean Escard. (Metaux, Alliages et Machines, Jan., 1919; 2¾ pp.)

10573—SODIUM Salts in 1917. Roger C. Wells. (Mineral Resources of the U. S., 1917—Part II; 37 pp.)

PETROLEUM AND NATURAL GAS

10574—COLOMBIA—Petroleum Development Now Under Way and in Prospect in Colombia, South America. (Oil Tr. Journ., Feb., 1919; 1 pp.) 40c.

10575—GOVERNMENT CONTROL—Coöperation in the Oil Industry. (Min. and Oil Bull., Jan., 1919; 3 pp., illus.)

10576—MOROCCO—Les Terrains Petrolifères au Maroc. G. Moussu. (Bull. Soc. d'Encouragement, Sept.-Oct., 1918; 6½ pp., illus.)

10577—NATURAL GAS: Its Production, Service and Conservation. Samuel S. Wyer. (Bull. 102, Part VII. U. S. National Museum, Mineral Ind. of the U. S., 1918; 67 pp., illus.)

10578—NATURAL-GAS STORAGE. L. S. Panyity. (Bull. 145, A. I. M. E., Jan., 1919; 2¾ pp., illus.)

10579—OIL SHALE—Commercial Possibilities of Oil Shale. Harry J. Wolf. (Eng. and Min. Journ., Feb. 1, 1919; 2¾ pp., illus.) 20c.

10580—OKLAHOMA—Structure and Oil and Gas Resources of the Osage Reservation, Oklahoma. Frank R. Clark. (Bull. 686-I, U. S. Geol. Surv., 1919.)

10581—SCOTLAND—The Scottish Mineral Oil Industry. (Journ. Soc. Chem. Ind., Dec. 31, 1918; 1¾ pp.)

10582—WATERS—Petroleum Hydrology Applied to Mid-Continent Field. Roy O. Neal. (Bull. 145, A. I. M. E., Jan., 1919; 7¾ pp.)

ECONOMIC GEOLOGY—GENERAL

10583—BRITISH COLUMBIA—Economic Geology of the Hazelton District, B. C. J. J. O'Neill. (Can. Dept. of Mines, Geol. Surv., Summary Report, 1917, Part B, 1918; 3 pp.)

10584—BRITISH COLUMBIA—Reconnaissance Along the Pacific Great Eastern Railway Between Squamish and Lillooet. C. Camsell. (Can. Dept. of Mines, Geol. Surv., Summary Report, 1917, Part B, 1918; 11 pp., illus.)

10585—DIPS—Anomalous Dips. Eugene Wesley Shaw. (Econ. Geol., Dec., 1918; 11¾ pp.) 60c.

10586—NEVADA—The Genesis of the Ores at Tonopah, Nevada. Edson S. Bastin and Francis B. Laney. (Prof. Paper 104, U. S. Geol. Surv., 1918; 50 pp., illus.)

10587—RACEWINITE: A Peculiar Mineral from Ore Deposits in Utah. A. N. Winchell. (Vol. XIII, Econ. Geol., Dec., 1918; 5 pp., illus.)

10588—TESTS—Simple Tests of Economic Minerals. Herbert Lang. (Min. and Sci. Press, Jan. 4, 1919; 2¾ pp.) 20c.

MINING—GENERAL

10589—ALASKA—Alaska's Mineral Development During 1918. J. L. McPherson. (Min. and Sci. Press, Jan. 11, 1919; 3 pp., illus.) 20c.

10590—ANTHRACITE MINING COSTS—R. V. Norris, E.M., M. Sc. (Bull. 146, A. I. M. E., Feb., 1919; 14 pp., illus.)

10591—CANADA—A General Summary of the Mineral Production of Canada During the Year 1917. John McLeish. (No. 499, Can. Dept. of Mines, 1919; 27 pp.)

10592—COAL—Methods of Mining Coal. W. C. Bochert. (The Pahasapa Quart., Feb., 1919; 14 pp., illus.)

10593—DRAIN TUNNEL—The Tintic Drain Tunnel and Its Objects. E. E. Grimes. (Salt Lake Min. Rev., Feb. 15, 1919; 3 pp., illus.) 20c

10594—DRILLING—Shot Drilling Around Thetford Mines. J. W. Davis. (Can. Min. Journ., Jan. 22, 1919; 2 pp., illus.) 20c.

10595—EXPLOSIONS—Effect of the Velocity of Ventilating Current Upon Mine Explosions. G. S. Rice and W. L. Egy. (Coal Age, Feb. 13, 1919; 1¼ pp., illus.)

10599—IDAHO—Mining in Idaho in 1918. R. N. Bell. (Eng. and Min. Journ., Feb. 1, 1919; 2¼ pp.) 20c.

10600—INDIA—The Mineral Production of India During 1917. H. H. Hayden. (Vol. XLIX, Part II, Geol. Surv. of India, 1918; 62 pp.)

10601—INTERNATIONAL CONTROL OF MINERALS. C. K. Leith. (Mineral Resources of the U. S., 1917—Part I; 10 pp.)

10602—MADAGASCAR—Les Mines de Madagascar en 1918. M. F. Bonnefond. (L'Echo des Mines et de la Metal., Jan. 5, 1919; 1 p.)

10603—MANITOBA—Mining in Northern Manitoba, 1918. R. C. Wallace. (Can. Min. Journ., Dec. 15, 1918; 3 pp., illus.)

10604—MEXICO—Mining in Mexico Today. (Eng. and Min. Journ., Jan. 25, 1919; 2¾ pp., illus.) 20c.

10605—MEXICO—The Future of Mexican Mining. (Eng. and Min. Journ., Feb. 1, 1919; 1¼ pp.) 20c.

10606—MINE CARS—Standardization of Mine Cars in Metal Mines. R. M. Raymond. (Eng. and Min. Journ., Feb. 1, 1919; 4¼ pp., illus.) 20c.

METALLURGY—GENERAL

10611—ADMIRALTY GUN-METAL—The Influence of Impurities on the Mechanical Properties of Admiralty Gun-Metal. F. Johnson. (Advance copy, Inst. of Metals, Oct., 1918; 12 pp., illus.)

10612—ALLOY—A Case of Disintegration of a Copper-Aluminum Alloy. Richard Seligman and Percy Williams. (Advance copy, Inst. of Metals, Oct., 1918; 3 pp., illus.)

10613—ALLOYS of Copper and Zinc: An Investigation of Some of Their Mechanical Properties. F. Johnson. (Advance copy, Inst. of Metals, Oct., 1918; 9 pp., illus.)

10614—BRASS—A Comparison of Grain-Size Measurements and Brinell Hardness of Cartridge Brass. W. H. Bassett and C. H. Davis. (Bull. 145, A. I. M. E., Jan., 1919; 21¼ pp., illus.)

10615—BRONZE—Effect of Heat Treatment on Bronze. F. F. Hausen and O. A. Knight. (Iron Age, Feb. 6, 1919; 2¼ pp., illus.)

10616—BRONZES—The Constitution of the Tin Bronzes. Samuel L. Hoyt. (Bull. 144, A. I. M. E., Dec., 1918; 6¾ pp., illus.) 40c.

10617—COPPER PLATING—Automatic Copper Plating. Joseph W. Richards. (Bull. 145, A. I. M. E., Jan., 1919; 5 pp., illus.)

10618—ELECTROSTATIC PRECIPITATION. R. B. Rathbun. (Min. and Sci. Press, Jan. 4, 1919; 1 p.) 20c.

10619—FOUNDRY—Use of Oil Fuel in the Foundry in Urgent Exceptional Circumstances. A. E. Plant. (Advance copy, Inst. of Metals, Oct., 1918; 5 pp.)

10620—HARDNESS OF METALS—The Resistance of Metals to Penetration Under Impact. C. A. Edwards. (Advance copy Inst. of Metals, Sept., 1918; 28 pp., illus.)

10621—MANGANESE BRONZE—P. E. McKinney. (Bull. 146, A. I. M. E., Feb., 1919; 4¼ pp.)

FUELS

10627—COAL—Lignite Coals and Their Utilization. C. C. O'Harra. (The Pahasapa Quart., Feb., 1919; 21 pp., illus.)

10628—COAL CONSUMPTION—Report on the Rate of Coal Consumption in Various Electric Generating Stations and Industrial Establishments in Canada and the United States. (Hydro-Electric Power Commission of Ont., Feb. 15, 1918; 12 pp., illus.)

10629—CONSERVATION—Coal Economy from a National Standpoint. W. H. Casmey. (Trans. of the Manchester Geol. and Min. Soc., May, 1918; 16¼ pp., illus.)

MINING AND METALLURGICAL MACHINERY

10634—COMPRESSING AIR Efficiently. Charles A. Hirschberg. (Compressed Air Mag., Feb., 1919; 10¾ pp., illus.)

10635—ELECTRIC FURNACES—Electric Heated Industrial Furnaces. Geo. J. Kirkgasser. (Ind. Management, Jan., 1919; 6¼ pp., illus.) 40c.

10636—ELECTRICAL MACHINERY—Some Developments in the Electrical Industry During 1918. John Liston. (Gen. Elec. Rev., Jan., 1919; 38 pp., illus.)

SAMPLING AND ASSAYING

10637—COAL—Sampling and Analyzing Coal. Charles Bentley. (The Pahasapa Quart., Feb., 1919; 6 pp., illus.)

10638—COAL ANALYSIS—Method of Least Squares Applied to Estimating Errors in Coal Analysis. J. D. Davis and J. G. Fairchild. (Tech. Paper 171, U. S. Bureau of Mines, 1918; 36 pp., illus.)

10639—PHOSPHORUS IN BRONZES, Rapid Method of Estimating. T. E. Rooney. (Advance copy, Inst. of Metals, Oct., 1918; 2 pp.)

10640—SAMPLING. F. W. Bunyan. (Min. and Sci. Press, Dec. 21, 1918; 6 pp., illus.) 20c.

INDUSTRIAL CHEMISTRY

10641—AMMONIA RECOVERY—Effect of "Direct" and "Indirect" Ammonia Recovery Upon Other Byproducts. Thomas B. Smith. (Iron and Coal Tr. Rev., Dec. 27, 1918; 1 p.) 40c.

10642—ARSENICAL COMPOUNDS and Sodium Carbonate. M. Rindl. (So. Afr. Journ. of Ind., Nov., 1918; 9 pp.)

10643—COAL GAS—The Relation Between Molecular Structure and the Activity Towards Hydrogen Sulphide of Oxide of Iron. G. Weyman. (Journ. Soc. Chem. Ind., Dec. 31, 1918; 3¾ pp.)

MISCELLANEOUS

10648—EDUCATION—Need for Vocational Schools in Mining Communities. J. C. Wright. (Bull. 145, A. I. M. E., Jan., 1919; 3¾ pp.)

10649—HEALTH—Prevention of Illness Among Employees in Mines, A. J. Lanza, M.D. (Bull. 146, A. I. M. E.; 3 pp.)

10650—LABOR—Employment of Mine Labor. Herbert M. Wilson. (Bull. 145, A. I. M. E., Jan., 1919; 3 pp.)

Personals

Have You Contributed to the Association of the 27th Engineers?

W. A. Bancroft, treasurer of the Mass Consolidated Mining Co., of Boston, Mass., recently visited the Lake Superior district.

A. J. Robin, assayer and chemist, formerly of Durango, Colo., has sold his business there and is at present in Denver, Colorado.

W. H. Goodchild has been in Cuba on examination work. He was in New York recently for about a week, and has now returned to London.

James Humes, formerly superintendent of the Silver King Coalition Mines Co., Park City, Utah, has resigned. He is succeeded by **S. A. Knowles.**

Lieut. Leighton Stewart, who has been overseas with the Canadian Engineers, has returned to New York, where he has reopened an office at 42 Broadway.

James MacNaughton, vice-president and general manager of the Calumet & Hecla Mining Co., Calumet, Mich., has returned home from a business trip to New York and Boston.

C. F. Tu and **T. L. Chang**, Chinese mining engineers, are making a tour of the mining districts of the United States, and are studying the methods employed in the Grass Valley and Nevada City districts of California.

C. M. Wilson, formerly engineer for the Garfield Smelting Co., has been appointed chief engineer of the Mexican department of the American Smelting and Refining Co., at El Paso, Texas. He succeeds **L. M. Sheridan**, who resigned.

H. W. Edmondson, recently a captain in the U. S. Engineering Corps, has received an honorable discharge from the Army, and left New York on Feb. 25 for Oatman, Ariz., where he will examine the Vivian Leyland group of mines.

S. M. Levy, superintendent of the Calaveras Copper Co., has returned to Copperopolis, Calif., from New York, where he had been in consultation with the owners of the mines, the Ames estate of Boston, and Charles A. Stoneham, of New York.

Lieut. W. V. DeCamp, formerly mine superintendent for the Consolidated Arizona Smelting Co., Mayer, Ariz., and until recently stationed at Camp Humphries, Va., has received his discharge and is now doing special work at the Columbia School of Mines, New York.

Lieut. Robert Earle McConnell, mining engineer, sailed on Feb. 27 for Europe in the interest of the U. S. Government to proceed with representatives of associated powers upon an investigation of special engineering developments. Lieut. McConnell is to be absent for three or four months.

J. H. McMillan, provincial district inspector of mines for the Prince Rupert district, British Columbia, has resigned to become general manager of the Jasper Park Collieries, Ltd., of Alberta, Canada. He will have his headquarters at Pocahontas, where the company's largest colliery is situated.

P. H. Royster, of the U. S. Bureau of Mines, Pittsburgh, Penn., recently registered at the office of the American Institute of Mining and Metallurgical Engineers, New York. Others who registered there during the last week were: R. R. Landon, from the Philippines; Major L. W. Wicks; H. B. Smith, of New Britain, Conn.; D. B. Stevett, of St. Cyr, Quebec, Canada; and Prof. William R. Chedsey, of State College, Pennsylvania.

Obituary

Charles H. Gibbs, geologist, died on Feb. 18, after an illness of several days. He settled in Utah in 1904, where he became geologist for the Utah Fuel Co. and general manager of the Wasatch Mines Co. at Alta. He was a member of the American Institute of Mining Engineers, and of the American Mining Congress.

Dennis Reardon, formerly superintendent of the Green Hill-Cleveland mine, in the Coeur d'Alene district of Idaho, died recently in Los Angeles, Calif. He had been actively connected with mining operations for more than a quarter of a century. About two years ago he took charge of the property of the Royal Mining Co., in Missoula County, Mont., where a body of high-grade ore was developed.

Joseph Sillman, president and founder of the Michigan Smelting and Refining Co., Detroit, Mich., died of pneumonia at his home on Feb. 15. He settled in Detroit about 25 years ago, and in 1900 established the company of which he was the dominating genius up to the time of his death. His special ability in the reclamation of certain waste materials was recognized by the Government, and he was made a member of the committee directing the equable distribution of non-ferrous materials and the reduction of waste of these materials. He was also active in the Government work of controlling the distribution of tin during the serious shortage of that material. Mr. Sillman was president of the Valley Smelting Co., of Cleveland, Ohio; vice-president of the Peninsular Brass Works, and secretary and treasurer of the Thiery & Kendrick Manufacturing Company.

George E. Drummond, president of the firm of Drummond, McCall & Co., of Montreal, died at Claridge's Hotel, London, England, on Feb. 17, after an illness of about one week. He was born in Ireland, in 1858, and in 1866 settled in Canada with his parents. In the year 1881 he became associated with James T. McCall, and the firm of Drummond, McCall & Co. was established. Business developed rapidly, and the firm soon became an extensive manufacturer as well as importer of iron and steel and was closely connected with various other mining and manufacturing interests. Mr. Drummond was president of the Drummond Mines, Ltd. He became president of the Montreal Board of Trade in 1904, and of the Canadian Manufacturers' Association. He belonged to many social clubs, and was a member of the Royal Colonial Institute of London, England. He was the author of "The Iron Industry in Canada" and "Fiscal and Imperial Defense Questions."

Societies

Mining and Metallurgical Society of America, New York section, held a meeting at Columbia University Club, 4 West 43d St. on Feb. 27. The principal subject of the evening was "Taxation as Applied to the Mining Industry."

American Association of Engineers will hold its annual meeting at Chicago, Ill., on May 13, when Col. Walter Dill Scott, in charge of classification of personnel, U. S. Army, will give a talk on "Fitting the Engineer to His Job."

Utah Society of Engineers held a meeting at Salt Lake City, Utah, on Feb. 19. The problem of potash production was discussed and a number of papers on the subject were presented. A paper was read by Dr. E. K. Cameron, formerly of the U. S. Bureau of Soils, on the "General Potash Situation." Germany's part in supplying the greater part of the market in the past was reviewed, and it was pointed out that it was now incumbent on America to become a factor in the supply. Other papers were: "The Nebraska Potash Brines," by Dr. W. D. Bonner; "Potash from Leucite Rock," by Guy Sterling, dealing with deposits of wyomingite owned by the Liberty Potash Co. and read by L. A. Bailey of that company; a paper by A. Cohen, chemist for the Mineral Products Co. in regard to the alunite deposits at Marysvale, read by L. D. Anderson. The process used in extracting potash from brine at Salduro, 120 miles west of Salt Lake, by the Solvay Process Co. was described by E. A. Margetts and a general outline of the agricultural uses of potash was given by E. M. Ledyard, agricultural director of the U. S. Smelting Co. An informal talk on the recovery of potash made by the Ogden Portland Cement Co. at Brigham City was given by O. C. Hart. The meeting was largely attended and there was considerable discussion.

Industrial News

Epping-Carpenter Pump Co., of Pittsburgh, Penn., announces that Theodore R. Hermanson, formerly with the Worthington Machinery Co., has become associated with the Epping-Carpenter company as works manager.

Pacific Coast Steel Co., Seattle, has opened a sales office at 52 Broadway, New York. L. G. Knight, who has been connected with the Seattle office for some time, will have charge of sales of products from the Seattle and San Francisco mills.

Trade Catalogs

Schieren Beltings. Charles A. Schieren Co., 30-38 Ferry St., New York. A new price list; 6 x 9; pp. 12; illustrated.

Storage Battery. Edison Storage Battery Co., Orange, N. J. Pp. 30; 6 x 9; illustrated. A pamphlet descriptive of Edison alkaline storage battery for electric vehicles.

Tanks. Walter A. Zelnicker Supply Co., 325 Locust St., St. Louis, Mo. Bulletin No. 259; 3½ x 8¼; pp. 16; illustrated. Descriptive of new and used tanks of all kinds and sizes. Copy free on request.

Storage Battery Locomotives. Edison Storage Battery Co., Orange, N. J. Bulletin No. 608; 6 x 9; pp. 24; illustrated. A pamphlet descriptive of Edison storage batteries for use in locomotives for metal mines, coal mines and industrial plants of all kinds.

Wiring Devices. Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Catalog in Spanish; 8 x 10½; pp. 24; illustrated. The majority of the C-H wiring devices are listed the same as in the 1919 English catalog. It is intended for distribution to the Central and South American trade.

Schieren Beltings. Charles A. Schieren Co., 30-38 Ferry St., New York. A pamphlet entitled "The Story of Schieren Beltings"; 5½ x 7½; pp. 32; illustrated. This bcok is dedicated to the belt buyers. It describes the various steps in tanning and manufacturing leather belting, and the extreme care and time required to transform the raw hides into an efficient means for transmitting power safely and continuously.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alumina, Production of. Ralph H. McKee, Ridgefield Park, N. J. (U. S. No. 1,290,269; Jan. 7, 1919.)

Amalgamating Pocket for Treating Ore. Erastus B. Bennett, Denver, Colo. (U. S. No. 1,290,016; Dec. 31, 1918.)

Blasting Gun. William H. Cherry, Shipman, Ill. (U. S. No. 1,290,086; Jan. 7, 1919.)

Boring Drill, Rotary. Howard R. Hughes, Houston, Tex. (U. S. No. 1,289,179; Dec. 31, 1918.)

Castings of Rare Earth Metals and Their Alloys, Process of Making. Alcan Hirsch and Marx Hirsch, New York, N. Y., assignors to Alpha Products Co., Inc. (U. S. No. 1,290,010-11; Dec. 31, 1918.)

Coke, Utilization of Acid. George L. Prichard, Port Arthur, Tex., assignor to Gulf Refining Co., Pittsburgh, Penn. (U. S. No. 1,290,345, Jan. 7, 1919.)

Coke Oven. Robert S. Moss, Chicago, and Arthur Roberts, Evanston, Ill. (U. S. No. 1,289,870; Dec. 31, 1918.)

Copper, Treatment of Cement. Clarence A. Hall, Philadelphia, Penn., assignor to Pennsylvania Salt Manufacturing Co., Philadelphia, Penn. (U. S. No. 1,290,024; Dec. 31, 1918.)

Drilling Holes in Rock, Process of. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,290,172; Jan. 7, 1919.)

Dump Car, Side Tilting. Alexander M. Gow, Duluth, Minn. (U. S. No. 1,290,735; Jan. 7, 1919.)

Ferromanganese, Process of Producing. John Tyler Jones, Pittsburgh, Penn., assignor to Thomas J. Howells, Pittsburgh, Penn. (U. S. No. 1,289,799; Dec. 31, 1918.)

Fire Clays, Art of Purifying. Henry L. Kohler, St. Louis, Mo. (U. S. No. 1,290,241; Jan. 7, 1919.)

Flotation Process. Rudolf Gahl, Miami, Ariz., assignor to Utah Copper Co. (U. S. No. 1,290,166; Jan. 7, 1919.)

Furnace. Alfred Smallwood, London, England. (U. S. No. 1,290,383-5; Jan. 7, 1919.)

Furnace, Alloying. Frederick L. McGahan, Los Angeles, Calif. (U. S. No. 1,290,268; Jan. 7, 1919.)

Furnace, Heat Treatment. Alfred Smallwood, London, England. (U. S. No. 1,290,384; Jan. 7, 1919.)

Furnace, Liquid Fuel. Dudley Wright, Bankfield, Ulverston, England. (U. S. No. 1,290,826; Jan. 7, 1919.)

Editorial Correspondence

SAN FRANCISCO, CALIF.—Feb. 21

University of California College of Mines has recently installed new equipment of working models for treatment of gold and silver ores, including latest standard types of flotation.

California Chapter American Mining Congress, recently organized, has elected following officers: George W. Starr, Grass Valley, governor; Albert Burch, San Francisco, first vice-governor; L. P. St. Claire, Los Angeles, second vice-governor; J. R. Kingsbury, San Francisco, third vice-governor, and L. D. Gordon, San Francisco.

RENO, NEV.—Feb. 22

The Attachment Levied Against the Rochester Mines Co. by the Elda Fina Mining Co., in connection with the $2,270,000 apex suit filed by the latter, has been released, and the Rochester mine and mill are again operating. Consolidation of the Rochester Mines Co., Rochester Merger Mines Co., Rochester Elda Fina Mining Co., Rochester Combined Mining Co., and Nenzel Crown Point Mining Co. is now assured, under an agreement recently signed. Funds will be administered and the mines operated by the trustees, F. M. Manson, manager of the Western Ore Purchasing Co., and Judge L. N. French. The Combined and Rochester mills have a capacity of more than 600 tons daily.

Non-Metallic Commercial Minerals are being produced in considerable volume in southern Nevada. M. C. Hole, representing Los Angeles interests, has built a plant for refining silica, which is being mined from large deposits near Beatty. Three grades of silica are produced, the greater part of the output being sold to manufacturers of glass and paints. Fluorine is shipped to the Pacific Coast from large deposits near Carrara, south of Beatty, and a refinery is to be provided. Carbonate of lime, used in making dry colors and whiting, is produced in large quantity near Ash Meadows. In the same district the Standard Oil Co. is working deposits of clay. The product is used in clarifying oil and is of superior quality.

PHOENIX, ARIZ.—Feb. 25

All Mines and Smelteries of the Verde District closed on Feb. 14 for a period of three months or more. United Verde and United Verde Extension were the first to shut down, following the failure of a sufficient number of miners to appear for work. At the former 182 men reported, and 65 at the latter, though the ultimatum previously issued by these companies called for 250 men at the United Verde and 100 at the Extension. There are now several thousand idle mine and smeltery workers in the district, and many more are indirectly affected.

Law Governing Mine-Shaft Operation has been introduced in a bill in the Legislature establishing state rules with the following provisions: Hoisting engineers must be over 18, not users of intoxicants or drugs; hoist must have indicator and rope marks; 800 ft. a minute to be the greatest speed in hoisting men; inspection daily; wire ropes when over 200 ft. deep; at least 25 ft. clearance in gallows frame; iron-bonnetted cage, with gates; buckets must be held for clearance 15 ft. above shaft bottom; and bulkheads must be provided above men working in bottom of shaft or winze.

Excavation of Sacramento Hill, with steam shovels which are now working upon the crest, by the Copper Queen company, is being conducted with considerable caution because the crest is above the only road and only railroad that enters Bisbee. The overburden of rock varies from 50 to 200 ft., but averages about 80 ft. This rock is being carried, at the rate of over 150,000 cu.yd. a month, to points around shafts, where level areas are to be provided for shops, and may create a new and level townsite for workmen's homes. Some rock also may go underground, for stope filling. It carries only a trace of copper.

Mine Taxes amounted to $115,112 out of a special school-tax levy of $132,605 for four districts. At Hayden, the Ray Consolidated and American Smelting and Refining companies paid all but $300 of the school district's assessment of $5986. The Gila County tax roll of $163,810,000 has 91% of the valuation assessed against mining companies. Mines, smelteries, and similar works, are set at about $148,600,000, town lots and improvements at $5,347,000, cattle at $3,100,000 and main-line railroads at $2,610,000. Within the state at large, the mining industry pays about 63% of the taxes, and, with the railroads and other larger corporations, pays 75% of the total. These taxes are assessed on an arbitrary valuation, on five-year production periods, so there will be no particular decrease this year, because of relatively low valuation of the gross product.

Ignorance of the English Language will seriously affect the Spanish-speaking miners of Arizona, if the passage of a bill occurs prohibiting the employment of all non-English speaking persons in mines, quarries, open cuts, tunnels, in elevators or on electrical construction, and around machinery. The state mine inspector, his deputies, or any state officer may be judges. Passage of such a bill would affect seriously the camps of Metcalf, Morenci, Clifton, Ray and Ajo, and hundreds of small properties nearer the Mexican border. At Ajo, only Indians and Mexicans would remain over summer in the open-cut work. The bill has passed the House, effective Jan. 1, 1920. Other mining legislation under consideration includes the miners' home bill, which appears to have been killed by adverse report; a bill demanding change rooms and baths for men in smelteries, which has been shelved, but such provisions are to be added to older legislation; a bill granting $10,000 bonus to the first producing oil well found in Arizona, which the Senate has favorably reported. Another act gives protection to water courses or wells against oil seeps or sumps. Arizona has no oil wells at present.

MORENCI, ARIZ.—Feb. 20

A Bond Issue of Greenlee County to the amount of $200,000 is to be voted on soon, the money to be used for road building and road repairs. It is intended to provide work for returning soldiers and sailors, and for men of the district thrown out of work by curtailment of mining operations. The roads are needed, and there will be little opposition from the taxpayers.

WALLACE, IDAHO—Feb. 22

Idaho Mining Association held its annual meeting at Boise on Feb. 11 and 12 and elected the following officers for the coming year: President, Jerome J. Day, of Moscow and Wallace; vice-president, J. B. Eldridge, of Boise; secretary and treasurer, Ravenal Macbeth, of Mackay; executive committee: James F. McCarthy, of Wallace; I. E. Rockwell, of Bellevue; W. N. Sweet, of Boise.

John A. Percival, president of the Consolidated-Interstate Callahan, when asked recently regarding the company's plans, said that the low prices of zinc and lead, high costs of labor and supplies, together with excessive freight rates, had made operation at a profit impossible. Under these circumstances it was his opinion that the company should suspend production and conserve its resources until conditions improve. However, no action is to be taken, according to Mr. Percival, until the directors, who will meet in New York on Mar. 3, have expressed their opinion. The company is now producing at the rate of 6000 tons of concentrates and crude ore per month, mostly zinc. Another matter that will be acted upon by the directors is the situation of the main office, now at 61 Broadway, New York. It was originally in Duluth. It is proposed to move the office to Wallace, which, Mr. Percival stated, is the logical place. There are three vacancies on the board of directors, caused by the resignation of the representatives of the American Metal Co., namely, C. M. Loeb, Otto Sussman, and Julian B. Beatty, all of New York. The vacancies may be temporarily filled by the directors, or the matter may go over until the annual meeting of stockholders on April 14.

Vocational Training of Miners, made possible through an appropriation by the Federal government, has been started under the supervision of Francis A. Thomson, dean of the Idaho School of Mines. Most of the applicants are ex-soldiers, and these will be given the preference. The initial class is now receiving instruction in the Morning mine, the property of the Federal Mining and Smelting Co. Although vocational training is common in other lines of industry, this is one of the first attempts to introduce it in mining, and the result is being watched with much interest by mine managers and experts in vocational training. Operators in the Coeur d'Alene district are giving the system cordial coöperation, for they recognize that its success means eventually higher efficiency in underground work. The school is under the immediate direction of F. H. Skeels, a mining engineer. The class now working in the Morning mine is engaged in running a drift under contract, which is expected to enable the pupils to earn fair wages; the cost to the company will be no more than if the work was done by its own employees. More applicants are on file than can be accommodated at this time, but it is expected that arrangements will be made to start classes in other mines.

BUTTE, MONT.—Feb. 22

Conditions in Butte following the 10-day period of excitement due to the strike called by the I. W. W. are again normal, and all companies are working that were operating at the time it was announced that there would be a reversion to the sliding-scale agreement. It is now certain that the strike was not caused by the refusal of the large majority of miners and craftsmen to accept the changed conditions, but was brought about by threats of violence to the men who dared to go to work. Upon declaring the strike, the I. W. W. organization announced that the mines would never operate again until the companies paid $6 a day for a six-hour day. When the men returned to work under protection, the I. W. W., calling the strike off, said that it would be resumed later and at the same time denounced the American Federation of Labor. It is to be noted that the Anaconda Copper Mining Co., though consenting to return to the sliding scale of wages based upon the price of copper, announced that it would pay 50c. a day bonus to each man. This, a purely voluntary act on the company's part, was promised in view of the fact that the cost of living was somewhat higher than when the sliding-scale agreement was entered into.

SALT LAKE CITY, UTAH—Feb. 21

Mine Safety Laws for the metal-mining industry are being prepared by the Utah State Industrial Commission. Rules drafted by C. A. Allen, chief of the mine inspection department and also in the employ of the U. S. Bureau of Mines, have been gone over by members of the commission working with a committee representing the mining industry, the object being to devise a set of uniform rules, which will serve as a basis for inspection work by the commission and by insurance companies. On the operators' committee are: C. E. Allen, United States Smelting and Refining Co.; V. S. Rood, Utah Apex mine, Bingham Canyon; O. N. Friendly, Judge Mining and Smelting Co., Park City; and A. P. Mayberry, Centennial-Eureka mine, Eureka. For the miners; Ephraim Adamson, Park City; for the industrial commission: W. E. Harrison, state metal-mine inspector, and C. A. Allen, chief mine inspector. Insurance companies were also represented. Later all operators of the state will be given opportunity for further suggestions.

The U. S. Bureau of Mines Station at the University of Utah has completed another year of work, report of which has been made by Thomas Varley, metallurgist in charge, to J. E. Merril, director of the School of Mines. Volatilization has been proved to be adaptable to ores carrying copper, lead, gold, and silver, whether the minerals were found as sulphides, oxides, or carrying carbonates or silicates. Recoveries of copper have been 90 to 98%, and recoveries on lead ores have been better than 90%, the gold in the ores also being saved. Silver ores have not given as good results, although in many cases the recovery has exceeded 80%. The problem

of obtaining higher recoveries on silver ores is at present under investigation. Under most conditions zinc has not been volatilized, and efforts are being made toward the subsequent recovery of that metal from the residues. The bureau is striving to determine means of treating low-grade and complex ores of the state by any feasible method. The milling equipment in the metallurgical building has been entirely overhauled, and much additional machinery installed. Attention will be devoted chiefly to the volatilization process and to ore dressing.

DENVER, COLO.—Feb. 24

The Number of Idle Men Is Increasing in Denver, and many of the returning soldiers are finding difficulty in getting back into civil life. An organized effort is being made by the U. S. Employment Service and Colorado employers to find places for the returning men. The efforts of operators in the mining districts are being repaid by a steady increase in the efficiency of their labor forces.

A Menace to Milling Operations in Colorado is recognized in a bill to prevent pollution of streams. This measure is most drastic in its provisions, and if enforced would close down every milling plant in the state. The bill was introduced by Representative Hall, of Jefferson County, and is backed by Golden interests, which are displeased with the muddy appearance of Clear Creek. If such a bill should become a law it would prevent new mills from running tailings into the streams, and might cause trouble for all plants operating under water rights which were not older than the rights of the irrigation ditches.

Production of Tungsten in Colorado has practically ceased. All the important mines in the Boulder field have been shut down. Operators contend that without a tariff to protect them from the cheaply produced Chinese ores and concentrates they can no longer profitably work their mines. During 1918 Colorado produced the equivalent of 1965 tons of concentrates carrying 60% WO_3 as against 5065 tons by the entire United States, and 1781 tons by California. The value of the Colorado output is estimated at $1,965,000. The bulk of this production is from Boulder County. During 1918, a total of 10,448 tons of tungsten ores was imported, of which 6465 tons came from China. The price during the greater part of the year was about $25 per unit of WO_3 for a 60% product. Since the signing of the armistice the price has declined rapidly, until there is little or no demand for the ore.

Colorado School of Mines may be controlled by its own graduates in the near future. The Fincher bill, which has just passed the second reading in the State Senate, provides that three of the five members of the board of trustees, appointed by the Governor, shall be alumni of the school. At present only one member of the board must be a graduate of the institution. To become a law, the bill must receive a favorable vote on final reading before the Senate, and must have the approval of the other branch of the Legislature. In the past the school has suffered as a result of ill-advised appointments by governors who did not fully appreciate that their appointees sometimes had little or no interest in the ultimate welfare of the school, or perhaps lacked both the training and experience that would make them desirable directors of an educational institution. Many believe that the passage of the Fincher bill will be a step in the right direction, and those interested in the welfare of the institution hope it will be a guarantee that the high standard of this well-known school of mines is to be maintained.

A Metal-Mining Fund is to be created by the passage of a bill introduced by Representative Girard and other members of the Mining Committee of the House. This bill was introduced in accordance with a resolution unanimously adopted at the annual meeting of the Colorado Metal Mining Association. Primarily the purpose of the proposed law is to provide a method whereby the producing metal mines of the state shall share equitably the expenses of maintaining a state organization. This is to be accomplished by a tax of one-twentieth of 1% of the gross output of the mines, or, in other words, a tax of 50c. per $1000 of output. Estimating the total production of the state at $40,000,000. this tax will raise approximately $20,000. Allowing for coöperative work with county and national mining organizations, this amount will be no more than necessary properly to conduct the activities of the organization. Under the state constitution, the present mining organization cannot be chartered, and only through some agency, more or less under the control of the state, is it possible to levy and collect a tax on mine output. This is effected in the proposed bill by the creation of the Metal Mining Fund and the appointment of a board of directors which it is assumed will also compose the executive board of the Colorado Metal Mining Association, and the Colorado Chapter of the American Mining Congress. The first section of the bill provides for the method of assessing and collecting the fund, which is based upon the gross output as determined by the statement filed with the county assessor under the provisions of the present law. Section 2 provides for the appointment of a board of nine directors, three of whom shall be appointed for a term of six years, three for four years, and three for two years. Section 3 provides for organization of the board, duties of the chairman, and for regular and called meetings of the board. Section 4 outlines the powers of the board, and authorizes investigations regarding the prospecting for, mining production, transportation, buying, selling, treatment or reduction of metalliferous ores, as well as economic conditions relating thereto. Under the provisions of this section it is proposed to give the board the right to make such investigations concerning the mining industry as it shall deem expedient or necessary, and, so far as possible, all powers now exercised by the present mining organization, and not to include anything that might prove burdensome to those engaged in the industry. Section 5 provides that the directors shall receive no salary, but shall be paid their actual and necessary traveling expenses in attending meetings of the board. These meetings shall be held quarterly, and at such other times as shall be decided by the president.

HOUGHTON, MICH.—Feb. 21

A Steam Shovel is being experimented with by the Quincy Mining Co. for underground use as an aid to tramming. Calumet & Hecla, having been conducting a similar experiment for some time, is constructing the shovels on a limited scale in its shops and expects to make a test on a larger scale. A completion of successful trials with shovel tramming, together with the replacing of back-breaking labor which the electric locomotives have already brought about, will solve the greatest labor problem in the Lake Superior mines, that of maintaining a new and constantly shifting supply of trammers.

Bolshevik Sentiment is singularly absent thus far in the Michigan copper and iron districts. Though general conditions are excellent, the feeling among the workingmen is that the copper-metal situation must show a betterment in the near future or further decline in the size of the twice-a-month pay check will come. Such a decrease seems to be certain in the case of the lower-grade and higher-cost producers. Up to the present time wages have been cut by but three of the smaller producers. Most of the mines are running on three-quarter time. A few like the Mohawk, Wolverine, and the mines of the Copper Range company have not curtailed production, nor have they cut wages, explaining that production has been running at less than 80% of normal for the last year. Smelteries in the district continue to pile up copper, but not in alarming quantities. Shipments of metal by freight are unusual and are made only on Government requisitions, filling orders placed before the war.

Electric Haulage will soon be installed at No. 6 shaft in the old Osceola workings. This is a very long haul. Two four-ton trolleys will be used. Five storage batteries will be placed in North Kearsarge Nos. 1 and 3. One is now used at the 15th level and one at the 16th level, No. 4 North Kearsarge, and doing efficient work. At the Calumet & Hecla mine proper, on the Osceola lode, the use of electric haulage has made profitable the low-grade copper ore. The locomotives haul two cars approximately 1000 ft. on each trip. Cars hold three and a half tons and dump by air back of shaft directly into skip. They are used at No. 13 shaft on the 20th, 21st, and 22nd levels; at No. 14 on the 17th, 18th, 19th, and 20th levels; at No. 15 on the 18th, 19th, 20th, and 22nd; and at No. 17 on the 15th, 16th, and 17th levels. Ahmeek has 12 power locomotives, using them in the same way as the Calumet & Hecla and Isle Royale use them. At No. 2 shaft they are working on the 17th, 18th, 19th, and 20th levels; also at the 18th and 19th of No. 3, and at the 15th, 16th, 17th, 18th, and 19th levels of No. 4. Isle Royale is using four at each shaft, Nos. 4, 5, and 6. At this mine the cars carry five tons an average distance of 800 ft., each car filling a skip.

YELLVILLE, ARK.—Feb. 22

Mine Operators in the North Arkansas Field are protesting against a bill that is before the Arkansas Legislature which, if passed, will levy a tax of 40c. a ton on all lead and zinc ores. Zinc mine operators, especially, consider the measure drastic at such a time as this. Under present conditions the industry is carrying a heavy load in view of the high operating expenses and low ore prices, and operators feel that an additional burden should not be placed upon them. The bill also imposes a tax of 6c. a ton on coal and 18c. a ton on bauxite, as well as a tax on timber products.

NEW YORK—Feb. 20

The Kennecott Copper Corporation will issue Mar. 1, 1919, $12,000,000 in one-year 6% notes, it is officially announced. Although the corporation has cash and Government bonds on hand amounting to approximately $7,000,000, which ordinarily would be sufficient for its purposes, under present conditions it is deemed wise to obtain these additional funds to provide for carrying a considerable stock of copper pending the return of better copper market conditions, as well as to take up $4,000,000 notes of the company, now outstanding, due Mar. 21; to provide for the acquisition of additional properties in Alaska, and in connection with the enlargement of the Braden Copper Co.'s plant in South America. Production has been curtailed over 5% at the mines in Alaska and South America. Work is progressing on new units at Braden mines, which will give 10,000 tons' monthly capacity. Miners' wages at Kennecott have been cut by $1 a day to the 18c. basis.

VICTORIA, B. C.—Feb. 22

Mining Engineers Employed by the Government of British Columbia, of whom there are six, each having charge of one of the mineral districts into which the province has been divided, are to be given authority to make examination of any metalliferous mine, reduction works or concentrating plant of the province. Refusal to recognize their authority will entail a fine of from $10 to $500. It is not suggested that the engineers have received anything but the most courteous treatment from mine and smeltery operators, but William Sloan, Minister of Mines, intends that the engineers shall be provided with full authority in carrying out their duties.

The Decision to Install Electric Furnaces for smelting British Columbia iron ores on the commercial waterway near Seattle, Wash., reached by the Smelters Steel Co., has been received with special interest in British Columbia because of the efforts being made to interest capital in such an industry on the Canadian side. Whether the company will proceed with such an installation for the treatment of British Columbia ores in view of the provincial tax of 37½c. per net ton of ore mined, is considered doubtful. It will be recalled that the provincial government, in furtherance of its desire to see the industry initiated in the province, has offered a bounty of $3 per net ton of pig iron manufactured from local ores and $1.50 per net ton of pig iron produced from foreign ores. This, it is considered, is a satisfactory recompense, when the iron is made in British Columbia, the bounty being substantially above the tax. However, it is said that the Smelters Steel Co. purposes installing four electric furnaces, with a total capacity of 30 tons of high-grade gray iron per day. The furnaces are to be of the arc type, with one electrode to each furnace. The company is reported to have abundant supplies of the flux necessary for smelting purposes near its mines.

TORONTO, ONT.—Feb. 26

Railroad Into Kirkland Lake District was urged upon Sir William Hearst, Premier of Ontario, and other members of the cabinet, by a deputation of mining men who are interested in this gold area. The construction of a branch of the Temiskaming & Northern Ontario R.R. into the Kirkland Lake mining center, a distance of about six miles, they contended, was fully justified by the rapid development of the district, where there are now four producing mines and three others which have mills in the course of construction. At present, all supplies and the output of the mines have to be transported over a wagon road. The Premier gave an encouraging reply, and promised a thorough inquiry into the condition and needs of the district. The deputation also asked for the establishment of a mining recorder's office at Swastika.

The Mining News

ARIZONA

Cochise County

CALUMET & ARIZONA (Bisbee)—Oliver shaft closed down; 100 miners dropped or transferred to other workings.

COPPER QUEEN (Bisbee) — Last month's removal of overburden on Sacramento hill was 163,000 yd., compared with 100,000 yds., best previous record for the steam shovels.

TUNGSTEN REED (Hereford) — Installing concentrator; boilers and crushers on ground. Water line being laid from series of Huachuca Mountain springs.

Gila County

IRON CAP (Copper Hill)—December production of copper was 990,000 pounds.

Greenlee County

ARIZONA COPPER (Clifton)—Curtailment of operations to start Mar. 1. Details not announced.

ASH PEAK EXTENSION (Duncan)—Main shaft down 325 ft. Will contract for another 100 ft. of depth.

PHELPS DODGE CORP. (Morenci)—Arizona Central mines on single shift. Concentrator and smeltery on five-day-week basis. Copper production to be reduced to 1,250,000 lb. per month. On Feb. 15, blast main to furnace exploded for length of about 200 ft.; line quickly repaired and operations resumed by February 18.

Mohave County

HACKBERRY (Hackberry)—Big mill to start about Mar. 1, on 100,000 tons of developed ore, carrying silver, lead and zinc. Property lately visited by James Murray, of Butte, Montana.

BELLA UNION (Kingman)—Trial run completed of 50-ton mill; erected before ore development had been made.

RICO (Kingman) — First payment of $15,000 on property made to Clack brothers. Compressor and gas engine purchased; plans being made for milling plant, which will use mine water.

Pinal County

KELVIN SULTANA (Kelvin)—Judgment for plaintiff in suit brought by Phoenix Savings Bank and Trust Co., trustees, and property sold. All property, real and personal, purchased by M. M. Hawley, of Chicago.

BUCKHORN (Mesa)—Intend to sink 700 ft., two-compartment shaft about 500 ft. west of present shaft. Present equipment, with addition of compressor, will be used.

YOUNG GOLD (Mesa)—Mine being unwatered preparatory to starting mill; latter idle for about a year.

ARIZONA HERCULES (Ray) — Mill treating about 1000 tons daily now. Pipe line being constructed across Gila River from pumping plant on Kelvin Sultana property.

RAY BROKEN HILLS (Ray)—New tunnel driven approximately 600 ft. Property being surveyed for patent.

MAGMA COPPER (Superior)—January production of copper was 900,000 lb.; December, 1,049,783 pounds.

QUEEN COPPER (Superior)—Getting estimates for new power plant. No decision as yet on equipment.

RED TOP (Superior)—Personal property of Arizona Bonanza Copper Co. sold to satisfy claims brought by P. Hays, of Phoenix. Company will be reorganized and work resumed.

Santa Cruz County

THREE R (Patagonia)—Magma Copper Co. failed to take up option for $750,000. Now reported property being sampled for American S. and R. Company.

Yavapai County

BLACK BUTTE (Constellation) — Purchased by new Omar Mining and Milling Co.; to be under management of R. T. Barton, former owner. Gibson milling plant ordered, with equipment to have daily capacity of 18 tons of silver-lead concentrates.

CALUMET & JEROME (Jerome)—In 80-degree diamond-drill hole, 20 ft. of blue schist, carrying chalcopyrite struck at 320 ft. depth. Ore can be developed by drifting 75 ft. from face of existing tunnel. Above schist 60 ft. of iron pyrites found.

VERDE HUB (Jerome) — Formerly known as Decatur. Will resume work with funds secured in Decatur, Illinois.

VERDE SQUAW (Jerome)—Shut down by T. H. Gray, manager, until big mines of district resume.

ANDREWS (Mayer)—Group acquired by Argonne Copper Co.; organized by D. A. Finlayson and Mathew Hall.

COPPER QUEEN GOLD (Stoddard)—Plans for resuming work announced by president. Louis Goldman, Los Angeles, California.

HOMESTEAD (Walker)—Taken over by U. S. Continental Mines Co.; Mark Bradley in charge. Main shaft to be sunk from 125 to 350 ft.; new hoist and compressor to be installed.

Yuma County

CRITIC (Wenden) — Reported to have found gold telluride ore on 350 level. Carries copper and trace of silver.

RED CLOUD (Yuma)—Leased to International Metal Co., of Los Angeles; Arthur F. Flint in charge. Red Cloud Co. badly affected by burning of new $150,000 mill.

ARKANSAS

Boone County

MARGUERITE (Everton) — Okiozark Mining Co., which is operating Marguerite zinc-silicate mine, completing new concentrator. Equipment, aside from power, consists of 20-ft. two-log washer; five-cell rougher jig; six-cell cleaner jig; one set of 24-inch rolls; and battery of three tables of Wilfley type. Log washer first one installed in North Arkansas zinc field for concentrating zinc ore. Marguerite ore occurs in soft clay gangue free from rock. Rolls used to grind jig tailings before latter go to tables. Property developed by 1500-ft. tunnel and crosscuts. Shaft sunk into tunnel heading by new company, and ore will be moved to mill through both shaft and tunnel.

GLORIA (Zinc)—George Miller, superintendent, states company will put no ore on market until June 1, unless market advances to at least $40 a ton. Property will be kept in operation with small force and production stored.

Marion County

BIG BELL (Rush)—J. L. McCarty, general manager, states mill is making concentrates at rate of 10 tons a day.

MORNING STAR (Rush)—Leased by D. Melton, Alexander Rowden, and J. B. Melton, who have started mill and are working the dumps.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—Crushing about 9000 tons per month in 60-stamp mill. Much of best ore from lowest levels. Developed to 4600-ft. depth. Mill tailings retreated by concentration and cyanidation. Electric hoists capable of 7000-ft. depth in good working order.

KENNEDY (Jackson) — Developing new territory. Increasing crew underground. Mill running on fair-grade ore.

CENTRAL EUREKA (Sutter Creek)—Winze at 3500 level, 100 ft. deep, in milling ore. Drifts north and south at bottom of winze reported 140 ft. in ore. New hoist at 3500-ft. level installed. To clean out sump of main shaft and continue sinking. Enough ore blocked out to assure supply for 20 stamps.

OLD EUREKA (Sutter Creek)—Good ore disclosed on lower levels of shaft, deepening of which is to be completed soon. To start new lateral development.

Calaveras County

CALAVERAS COPPER (Copperopolis)—To install hoist at the North Keystone and deepen shaft to 450 ft.; also discovery shaft to 200 ft. Plan additions to crusher and mill. Blast furnace will start in spring.

Eldorado County

CHURCH UNION (Nashville)—Preparing for reopening and new development.

Nevada County

LABOR SURVEY shows 1125 men employed, with evidence of increase. North Star, 450; Empire, 408; Allison Ranch, 117; Golden Center, 78; Sultana, 35; Gold Point Mines, Inc., 35.

PITTSBURG-GOLD FLAT (Nevada City)—To reopen and develop vein disclosed two years ago in Gold Flat; work suspended on account of war. Development through Pittsburg shaft. Former producer.

BLUE POINT (Smartville)—Involved in further litigation regarding claims of $31,244 against Weissbein interests and $25,000 rentals, profits, and interest. Known as the Paddy Campbell mine. Former producer on large scale.

Plumas County

ENGELS COPPER CO. (San Francisco)—Annual election: Henry Engels, president; F. Kland, vice-president; E. E. Paxton, general manager; I. J. Truman, Jr., Richard Spreckels, O. G. Traphagen, J. F. Humburg, directors. Manager's report shows ore developed in tunnels 1, 2, 4, 5, 6. Ore averaging in excess of 2¼% copper, carrying gold and silver.

Shasta County

MAMMOTH COPPER (Kennett) — Expected reduction of 50c. a day in wage scale accepted by miners of Mammoth and Balaklala properties. A few men quit at the Balaklala, without demonstration. Affects about 750 men.

GREENHORN COPPER (Tower House)—Development employs 15 men underground. Surface survey of 260 acres, employing men discharged from Army and Navy.

BULLY HILL (Winthrop)—Mine on development work only. Flotation plant down owing to lack of market for copper and zinc.

Sierra County

SIXTEEN-TO-ONE (Alleghany)—New 10-stamp mill for stamping and concentrating only; electrically operated; capacity 30 to 40 tons daily. Operation begun Jan. 14. In general, ore is free milling. M. C. Sullivan, superintendent.

KIRKPATRICK (Forest) — To install ball mills, owing to flaky nature of placer gold.

LOFTUS BLUE LEAD (Howland Flat)—Restraining dam approved by Federal officers; electric plant and hydraulic monitors installed; ready for operation when weather settles; recent heavy snowfall greatly increased available water.

Tuolumne County

McCORMICK (Jacksonville) — Reported output since December, $20,000. Developed by tunnel from the river side, disclosing vein in lower levels which was pockety in upper ground. Andrew McCormick, of Stockton, owner.

PACIFIC GOLD (Jamestown)—New mill crushing 100 tons a day from Dutch-Sweeney mines. To be increased to 300 tons. Formerly the Dutch-Sweeney Mining Co. Also owns App mine adjoining. W. J. Loring, general manager.

IDAHO

Shoshone County

RICHMOND (Adair) — Five carloads copper ore shipped in February, and five in January. Sinking winze 200 ft. from lower tunnel. Ore delivered to railroad by aërial tramway.

AMBERGRIS (Burke)—Crosscut from No. 4 tunnel of Hercules developed shoot of commercial ore. Work transferred to main working level of Hercules and crosscut being run to cut vein 400 ft. deeper. Controlled by the Days.

COPPER KING (Mullan)—Special stockholders' meeting called to decide on offer to purchase property for $250,000 on following terms: Cash, $10,000; first year, $40,000; second year, $50,000; balance in payments of $50,000 yearly. Purchasers agree to keep 14 men continuously employed and build 50-ton mill. They are Seattle lumbermen.

GIANT LEDGE (Murray)—Work resumed. Shut down since last September. Shaft down 400 ft., with lead-silver ore developed on 200 and 400 levels. Company began construction of mill last summer, but it is not yet completed.

AMAZON-DIXIE (Wallace)—Vein cut by crosscut from bottom of shaft, 400 ft. below main tunnel. Eight feet exposed shows lead-silver and copper ore. Property in Montana, near state line. Controlled by Cleveland, Ohio, interests.

SUCCESS (Wallace)—Mine closed down and pumps withdrawn, because of low zinc and lead prices without corresponding decrease of wages and other mining costs. Mine reported having good bodies of ore on 1400, 1500 and 1600 levels. Under normal conditions can operate profitably.

SUNSHINE (Wallace)—Has taken over Sunset-Banner and Dewey groups of claims adjoining on west, making a group of 20 claims situated on both sides of Beaver Creek.

MICHIGAN

Copper District

ALLOUEZ (Allouez)—Using six storage-battery locomotives, one each on 19th and 20th levels of No. 1 shaft. Four trolley locomotives, 125 volts, in use in No. 2 shaft on long hauls; tramming efficiency increased.

SENECA (Calumet)—Concrete work in shaft near completion, following which sinking will be resumed.

HANCOCK (Hancock)—Shipped 24 cars of ore to mill week before suspending; cleaning up best of ore already broken down.

MOHAWK (Mohawk)—Ore tonnage increased 15% in first half of February. Underground force approximates requirements for first time in four years. No curtailment to date.

MINNESOTA

Cuyuna Range

LABOR SITUATION has eased considerably, and there is now a surplus of labor on the Range. There is at present no indication of any general reduction in wages.

CUYUNA-MILLE LAC (Ironton) — American Manganese Mfg. Co.'s mine closed down on Feb. 14; 200 men released. Believed shutdown is only temporary. Will remain closed until further ore sales are made from stock or until ore prices become stable.

JOAN NO. 3 (Ironton)—Has bottomed drop shaft successfully. Property controlled by Marcus L. Fay.

ONEIDA MINES CO. (Ironton) — Closed down Clark and Sultana mines Feb. 8. Pulled pumps, allowing mines to flood. Sultana hoisted over 9000 tons manganiferous iron ore in January and has 40,000 tons in stockpile. Uncertain ore market, together with tonnage in stock, caused shutdown. New shaft in Clark started in June, 1918, and bottomed successfully in January; is completely equipped, with all surface work done.

WHITMARSH (Ironton) — Martin and Huntington mines completely equipped for full production.

ROWE (Riverton)—Formerly operated by Pittsburgh Steel and Ore Co.; will be operated by Pickands, Mather & Co. this season. Small amount of stripping will be done to uncover more ore; underground workings will be developed from shaft sunk last year; will mill ore in open pit and mine underground ore. Plan to produce full capacity this season. Ore in pit formerly worked by steam shovel is exhausted; washing plant to be dismantled and sold.

MISSOURI

Camden County

OSAGE (Damsel) — Two-compartment shaft down 112 ft.; concrete lining in first 51 ft. completed, including collar extending 12 ft. above surface. Headframe now being constructed. Intend to deepen shaft to 207 ft. depth, where drillings showed lead and zinc ore carrying gold and silver. Reported low-grade ore in shaft at 80-ft. level. L. W. Jeffords, president.

MONTANA

Jefferson County

COMET (Basin)—Arrangements to be concluded for first 150-ton unit of proposed mill. Will provide for jig and table concentration and flotation. Development continuing on 600 level. Shipping 20-25 tons of ore daily.

CRYSTAL (Basin)—Shipping four to five cars monthly of copper-silver ore. Considerable milling-grade ore blocked out. Lease and bond taken on Goldsmith property. Cntrolled by E. P. Barry and associates.

Silver Bow County

ANACONDA (Butte)—Producing large zinc tonnage; 1200 tons on Feb. 19 and 1600 tons Feb. 20. Zinc ores averaging over 11% zinc, with silver and lead in addition. Custom copper and zinc ores shut off from treatment at smeltery, Butte & Superior and other shippers being notified to cease shipments.

BOSTON & MONTANA DEVELOPMENT (Butte)—Locomotive fired for first time on Feb. 17 on Montana Southern Ry. at Divide. Operation of road expected to begin early in May. Large tonnage of ore in sight on 1000 level of Idanha vein. Development work on Park fissure progressing.

NORTH BUTTE (Butte)—January production was 2,241,829 lb. copper; 99,070 oz. silver; and 143 oz. gold. December output of copper was 2,230,507 pounds. Operations resumed at Speculator on Feb. 19, engine trouble resulting in suspension of night shift. Speculator shaft to remain closed. Daily tonnage, 1200.

NEVADA

Esmeralda County

GOLDFIELD CONSOLIDATED (Goldfield)—Goldfield Development Co. has leased all property, except mill, for five years; will bear all expense and pay 15-20% royalty. Has also purchased Hazel Queen claim and obtained bond on February claim.

Lincoln County

PIOCHE SHIPMENTS of ore for week ended Feb. 13 were: Prince Consolidated, 28 cars; Virginia-Louise, seven; Consolidated Nevada-Utah lessees, two.

BOSTON-PIOCHE (Pioche) — Second payment of $4000 reported made by Mascot Mining Co., lessee, which has resumed operations, after month's shutdown due to influenza. Formerly known as Yuba East group.

DAY (Pioche)—Situated in Bristol district; recently leased to Black Metals Mining Co., controlled by Snyder Bros., of Salt Lake City. Installing hoist and other equipment, preparatory to beginning operations.

PIOCHE MINES (Pioche)—Mill in operation and producing concentrates. Operations hampered by water shortage.

VIRGINIA-LOUISE (Pioche)—During January, 260 ft. of development work performed; 1544 dry tons of iron-manganese fluxing ore, averaging .01 oz. gold, 3.7 oz. silver, and 3.7% lead, shipped.

Nye County

HIGH DIVIDE, Gold Seam, Rosetta Divide, and Gold Reef preparing to develop their ground.

ALTO DIVIDE (Divide)—Charles S. Sprague and associates have bought this group, adjoining Gold Zone and East Divide, and have ordered hoisting equipment.

BROUGHER DIVIDE (Divide)—Station and sump at 500 level completed and crosscut being driven to vein, about 100 ft. distant. Quartz seams cut in shaft at 480 feet.

DIVIDE CONSOLIDATED (Divide)—Property, including Empire group, adjoins Brougher Divide on northwest, covering extension of main silver vein of Divide. High-power surface equipment purchased, and a large shaft will be sunk at least 800 ft. J. H. Miller is president and F. M. Manson vice-president. William Watters, superintendent of Divide mine, is a director.

DIVIDE EXTENSION (Divide)—Equipment being provided to sink 150-ft. shaft to 400 ft. Adjoins Divide on north.

EAST DIVIDE (Divide)—Shaft nearing 300-ft. point, where crosscuts will be driven to two veins shown at surface. Blow-out near shaft yields assays low in gold.

GOLD ZONE (Divide)—Drift extended to Divide boundary on 500 level failed to expose commercial ore. Crosscuts started to prove whether vein has faulted.

NORTH DIVIDE (Divide)—Hoisting machinery being installed on property, adjoining Sutherland Divide group.

SUTHERLAND DIVIDE (Divide)—Machinery purchased and will be installed soon at 400-ft. inclined shaft. This and shallow workings to east have produced shipping ore. J. B. Kendall, former superintendent of Goldfield Consolidated, is manager.

TONOPAH DIVIDEND (Divide) — Two large veins being prospected by drifts on 300 level. Several seams cut.

TONOPAH DIVIDE (Divide)—Crosscut from Divide main shaft on 470 level in exceedingly hard rock, but is expected to cut silver vein by Mar. 1. Auxiliary sinking hoist lowered from 370 to 470 level, and sinking will continue to water level, estimated at 800 ft. Additional mine buildings being erected, some having been brought from Millers, 15 miles west of Tonopah. Orebody at 370 level developed and blocked by crosscuts for length of 380 ft. and has average width of 26 ft. High-grade area at southeast over 40 ft. wide, and for length of 70 ft. has averaged $100 per ton. Ore shipped at rate of 35 tons daily to MacNamara mill at Tonopah.

TONOPAH HASBROUCK (Divide) — Electric hoist and compressor bought by superintendent, H. F. Bruce. Development work will proceed in 400-ft. shaft and 900-ft. tunnel, both showing good veins. Property has produced shipping ore and has several thousand tons of it in sight. Shipments to be resumed soon.

CONSOLIDATED MAYFLOWER (Pioneer)—Eight working faces on four levels breaking full widths of milling ore. Product being stored in old workings. J. B. Kendall, manager, has over 20 men using new "Turbro" drills and breaking ground rapidly. Mill to be enlarged to at least 125 tons' capacity by addition of ball mill. Ore free-milling and friable and can be treated at low cost. Main shaft of Pioneer mine being sunk from 400 to 800 feet.

TONOPAH EXTENSION (Tonopah)—Planned to sink Victor shaft from 1760 to 2060 ft. Ninety-foot steel headframe completed at this shaft, and large Nordberg hoist awaited.

TONOPAH WESTERN (Tonopah)—Negotiations progressing in plan to consolidate this with Great Western, Tonopah Bonanza, and contiguous properties, involving area of between 600 and 700 acres in western part of district. Coalition would result in sinking deep shaft to unwater all western region to at least 2000 feet.

VIRGINIA

Augusta County

CRIMORA MANGANESE (Crimora)—Property recently sold to the American Chemical and Industrial Co., Philadelphia. Plant shut down, but operations will be resumed soon.

Rockingham County

U. S. MANGANESE CORP. (Elkton)—Trustee's sale of plant and mines advertised for Feb. 28, at Harrisonburg, Va. Property listed for sale included about 147 acres on or near Hance's Mountain and railway running from main plant to Norfolk & Western Railway.

WASHINGTON

Stevens County

ELECTRIC POINT (Boundary)—Closed down temporarily owing to lack of market for property's low-grade lead ores.

CANADA

Ontario

ONTARIO-KIRKLAND (Kirkland Lake) —After considerable delay caused by shortage of electric power, new plant is in full operation. Funds are available for 1500 ft. of underground work.

BURMA

BURMA MINES (Namtu)—Now engaged in direct smelting of ore from Bawdwin mines. Second-grade ores will pass through mill, which is nearing completion (dated Jan. 1); will produce lead concentrates and zinc concentrates. Latter will go to acid plant and zinc smeltery at Sakchi, in Bengal, for further treatment. Will smelt lead concentrates locally.

CHOSEN

ORIENTAL CONSOLIDATED (Unsan) —Advices dated Jan. 5 state mills running full capacity, but short 350-400 men underground, retarding development work. Good headway being made in tunnel on Suribong power project, December footage being 221. Completion of tunnel expected by Mar. 1. Outside work at Suribong handicapped by cold weather.

The Market Report

SILVER AND STERLING EXCHANGE

Feb.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Feb.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
20	4.7580	101⅛	47⅞	24	4.7575	101⅛	47⅞
21	4.7575	101⅛	47⅞	25	4.7575	101⅛	47⅞
22	.....	....	47⅞	26	4.7575	101⅛	47⅞

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Feb.	Copper Electrolytic	Tin Spot.†	Lead N. Y.	Lead St. L.	Zinc St. L.
20	15⅞ @16	66¼	5.10 @4.90	4.70	6.25
21	15⅞ @15⅞	66¼	5.10 @5.15	4.80 @4.90	6.25
22	.....	...	.....	.....	.....
24	15⅞ @15⅞	66¼	5.10 @5.15	4.90 @5.05	6.25
25	15.05 @15.25	66¼	5.10 @5.25	5.00 @5.05	6.25
26	15 @15⅞	66¼	5.25	5.00 @5.05	6.25

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. Special shapes command a premium and cathodes sell at a discount of 0.125c. per lb.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

†For American tin of 99% grade.

LONDON

Feb.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
20	75	70	(a)	212	209	27⅛	24	*45
21	75	69½	(a)	215	212	27⅛	24	45
22	....	....	....	....	....	....	....	....
24	75	71	(a)	212	209	27⅛	21	45
25	75	70½	(a)	210½	206	27⅛	21	45
26	74	69½	85	222	213	27⅛	22	45

(a) No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK, Feb. 26, 1919

During the last week there was a further sharp decline in copper, while at the same time lead advanced. As we have pointed out repeatedly, lead is in the best statistical position of the metals. Zinc was dull and uninteresting.

The War Department, under date of Feb. 18, 1919, published a circular issued by the Director of Purchase, Storage and Traffic, which comprises the following paragraph: "It is believed to be of advantage to the Government in the settlement of any contract to have the contractor retain as much as possible of the property involved, provided he will take it at a fair price. Any property that cannot be disposed of in this way becomes surplus and should be turned over to the Director of Sales for disposal. The Director of Sales is at all times ready to take over and dispose of such property if the contractor will not pay a fair price for it, and it is not the policy of the department to sell property to contractors who are known to intend to market it, or contractors who take it for speculative purposes and not for their own use."

Copper—About the same amount of business was reported by producers as in the previous week, the aggregate being a little more than 5,000,000 lb., made up chiefly of lots of 100,000 to 500,000 lb., but there was one lot of 1,000,000 lb. reported. These figures reflect fully the character of the market. Consumers buy only in small lots and for their immediate requirements, everybody being averse to making commitments for more than a few days ahead. The business that is offered in this way is competed for eagerly, wherefore there were sharp cuts in prices, but in the latter part of the week that tendency seemed to be checked. Last Wednesday the market closed at 16c. Thursday opened with 16c. and closed at 15⅞c. On Friday considerable business was done at 15⅞@15⅝c. On Monday the market went lower still. There has been talk about copper having been sold at 15c., but no sales were made as low as that by any of the producers, and we have no direct information of sales of prompt copper of 15c. by anybody. Today the market was dull, with scarcely any business reported. Copper was freely offered at 15⅛c. and 15c. was reported bid.

Last week representatives of the War Department conferred with the copper producers respecting the liquidation of the stocks of copper held by the Government. While definite arrangements have not yet been consummated, it is probable that the Government's stocks will drift back into the hands of the producers. Although this will not reduce the stocks, it will remove a certain menace from the market.

Copper Sheets—The base price of copper sheets is 24½c. per lb. Copper wire is quoted at 19@20c. per lb. f.o.b. mill, carload lots.

Tin—There is nothing very new to report. The prohibition of imports of tin ore in the United States has caused a good deal of anxiety in Bolivia, where the producers are wondering when the market will again be open to them. At present they are not able to find any good outlet in Great Britain, which country is reported still to be maintaining its embargo on tin. In the meantime, stocks of tin are reported to be piling up in the Orient.

Lead—The business of this week was the largest of any week for a long time. Right from the beginning a strong demand developed from many quarters, including manufacturers of white lead, of blue lead products, and miscellaneous consumers, strange to say, one cartridge maker being among the number. The sales during the week, of which we have reports, aggregate 6000 tons. The American Smelting and Refining Co. advanced its price to 5.10c. on Feb. 20. The demand was so strong that other sellers immediately found that they could get better prices, and during Feb. 25 the Smelting company advanced again, this time to 5.25c. Sales have been made at that price, but not in so large quantities as earlier. However, the market closed strong.

The office of the Director of Sales, War Department, makes public the following statement: "A meeting was held Thursday afternoon in the office of the Director of Sales of the War Department to discuss the lead situation as affected by Government surplus. During the conference it developed that the surplus quantity of lead in possession of the War Department is a very small proportion of a year's production. While the Government's figures are not absolutely correct at the moment, it developed that on the basis of present information the War Department could not possibly have more than a few thousand tons to be disposed of ultimately. This quantity represents the surplus of lead in possession of the War Department which was allocated by the Lead Producers' Committee at the instruction of the Ordnance Department to be used on cost-plus contracts. Although the details of the arrangement have not yet been worked out, it is practically agreed that some arrangement can be made between the War Department and the lead producers by which the surplus stock of lead now in the hands of the War Department can be gradually fed into the market without affecting market prices and market conditions."

Zinc—This market continued very dull Business that was reported was all in the neighborhood of 6¼ cents.

Zinc Sheets—The quoted price of zinc sheets is $11 per 100 lb. This price was made on Feb. 4 and has continued to date unchanged. The quotations on zinc sheets in "Journal" issues of Feb. 8, 15 and 22 are in error.

Other Metals

Aluminum—Unchanged.

Antimony—The market was dull. We quote spot at 7@7⅛c. March-April shipments from China were offered as low as 6⅞c., New York, duty paid.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Market quotation: Ingot 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Weak at $85. San Francisco reports, by telegraph, $87; weak.

Silver and Platinum

Silver—Market continues quiet, with no change in New York official. The London fixed price has declined from 47⅞d. to 47⅜d., owing to a reduction in transatlantic freight rates, so as to be on a parity with New York price. No shipment of bar silver to London during the last week. China exchanges are weaker.

Mexican dollars at New York: Feb. 20, 77½; Feb. 21, 77½; Feb. 22, —; Feb. 24, 77½; Feb. 25, 77½; Feb. 26, 77½.

Platinum—Refined ingot, $100.

Palladium—Quoted at $115@120.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 22—Blende, per ton, high, $47.90; basis 60% zinc, premium, $45; Prime Western, $42.50@42; sludge, $40@38; calamine, basis 40% zinc, $28@25; Average selling prices, Blende, $42; calamine, $30; all zinc ores, $41.91.

Lead, high, $58.50; basis 80% lead, $55@50; average selling prices, all grades of lead, $53.20 per ton.

Shipments the week: Blende, 8661, calamine, 71; lead, 1048 tons. Value, all ores the week, $421,890.

Shipments two months: Blende, 85,520; calamine, 1732; lead, 10,100 tons. Value, all ores two months, $4,272,630.

Buyers advanced prices on all ores under premium grades to $42.50 basis at the week-end.

Word received here is that all zinc smelters are closing down 50% of their smelting capacity temporarily, awaiting a readjustment of metal conditions.

Platteville, Wis., Feb. 22—Blende, basis 60%, zinc, $45 base for premium grade and $40 base for high-lead blende. Lead ore, basis 80% lead, $50 per ton base. Shipments reported for the week are 1989 tons blende, 27 tons galena. For the year to date the totals are 13,395 tons blende, 525 tons galena, and 73 tons sulphur ore. During the week 2804 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—A slightly better demand was reported.

Manganese Ore—The supply of metallurgical ore continues far in excess of the demand.

Molybdenum Ore—No business was reported. Molybdenite is quoted nominally at 85c. per lb. of molybdenum sulphide content.

Tungsten Ore—There is no change in the situation in this market. Ore continues to arrive, which makes matters worse. The importation of tungsten ore in December, 1918, was 1033 long tons, whereof 75% came from China.

Pyrites—Unchanged at 16½c. per unit on the basis of 10s. ocean freight. Ocean freights are obtainable at 20@22s.

Iron Trade Review

PITTSBURGH—Feb. 25

From a few quarters come reports of somewhat heavier buying of steel products in the last few days, but the improvement is of slight consequence and the general situation of restricted buying continues. Buying is much less than would be sufficient to represent even an ordinary dull market. It remains a wonderful thing that the mills are operating as well as they are, when apparently there is hardly any actual consumptive demand, consuming lines, with few exceptions, being extremely dull. The conspicuous exception, of course, is the automobile trade, but it cannot, at best, engage as much as 5% of the steel-making capacity. The agricultural-implement makers are fairly busy, but are understood to have large stocks of steel which they are anxious to reduce. The car shops are doing hardly anything. There have been completed and delivered about 20,000 of the 100,000 cars ordered by the Railroad Administration last April, and a few more that railroads refuse to accept on account of the high price, and the whole matter is in abeyance. There are rumors that permission is to be given for resumption of work on some French cars. The Pennsylvania R.R. has instructed the Cambria Steel Co. to proceed with the manufacture of 3000 cars recently ordered. The Fleet Corporation is reducing its stocks of steel. There is hardly any building construction.

In face of conditions that would suggest the consumption of scarcely any steel, the mills continue to run at fair rates, the Steel Corporation at 90% of capacity or better and the large independents at about 60 to 80%, with a few small plants closed entirely. As capacity has increased 40% during the war, steel is being produced at a greater rate than the highest rate at which it was consumed at any time prior to the war. In other words, the situation is an extremely puzzling one. Some market reports attempt to harmonize by estimating production below the actuality and reporting more buying activity than is really found. Steel Corporation officials rather resent the widely published reports that the corporation is stocking steel.

Independent steel producers admit that the steel market is dull, and express the belief that it will not improve at present prices, but there is a divergence of opinion as to whether price reductions at this particular time would stimulate buying. In many quarters it is predicted that "there will be no price declines before Apr. 1," but, as that date is only five weeks distant, the statement is not particularly conclusive. The best guess seems to be that one or other of the large independents will announce price reductions in the heavy-rolled products by Apr. 1, of not less than $4 a ton and probably not over $10 a ton.

Pig Iron—There is scarcely any inquiry for pig iron, and apparently the chief reason former prices are maintained is that there is no business to be booked that would be worth cutting prices for. Though deliveries on contracts are fairly large, they are tapering off slightly. It is claimed that furnaces are piling little iron. We repeat former quotations: Bessemer, $32.20; basic, $30; foundry, $31; malleable, $31.50; forge, $30, f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh.

Steel—Quotations for regular soft steel are strictly maintained, at $43.50 for billets, $47 for sheet bars and small billets, $46 for slabs, and $57 for wire rods. There is enough inquiry to test the market, but scarcely any buying. Discard steel and regular shell steel can be had at lower prices than those just mentioned, rolled into billets of almost any size, but are in little demand. There is no buying of sheet bars, and shipments against contracts are light. Though independent sheet mills are operating at an average of 60 to 70%, the activity is chiefly among those that make their own steel.

Ferromanganese—The market continues dull. Furnaces continue to mention $200, delivered, as their asking price on 70%, but it is doubtful if any tonnage could be sold even at $150. Spiegeleisen is nominal at $57, furnace, asked, for 16 per cent.

Coke—The coke market is somewhat steadier, but not more active. Odd lots of demurrage coke are frequently offered at about $4.50 for furnace grade, but for regular production $5 would be asked. We quote Connellsville coke at $4.50@5 for furnace and $6 for foundry, per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	.....	37.742	42.792	.....
Mar.	73.861	88.082	.....	36.410	43.620	.....
April	73.875	95.346	.....	36.963	47.215	.....
May	74.745	99.505	.....	37.940	48.980	.....
June	76.971	99.500	.....	39.065	48.875	.....
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	.....	110.000	.....	125.000	.....
Mar.	23.500	.....	110.000	.....	125.000	.....
April	23.500	.....	110.000	.....	125.000	.....
May	23.500	.....	110.000	.....	125.000	.....
June	23.500	.....	110.000	.....	125.000	.....
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No Market.

Tin	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	.....	311.525	.....
March	(a)	.....	318.875	.....
April	(a)	.....	329.905	.....
May	(a)	.....	364.217	.....
June	(a)	.....	331.925	.....
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	.....	6.899	.....	29.00	.....
March	7.201	.....	7.091	.....	29.00	.....
April	6.772	.....	6.701	.....	29.00	.....
May	6.818	.....	6.704	.....	29.00	.....
June	7.611	.....	7.511	.....	29.00	.....
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Spelter	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.830	7.272	7.661	6.922	54.000	56.045
February	7.814	.....	7.639	.....	54.000	.....
March	7.461	.....	7.286	.....	54.000	.....
April	6.890	.....	6.715	.....	54.000	.....
May	7.314	.....	7.114	.....	54.000	.....
June	8.021	.....	7.791	.....	54.000	.....
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound London, pounds sterling per long ton.

Pig Iron Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	.....	33.95	.....	33.95	.....
March	37.25	.....	33.95	.....	33.95	.....
April	36.15	.....	32.95	.....	33.95	.....
May	36.20	.....	33.00	.....	34.00	.....
June	36.36	.....	33.16	.....	34.16	.....
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Feb. 25
Alaska Gold M.	3⅛
Alaska Juneau	1⅞
Am.Sm.&Ref.,com.	66⅛
Am.Sm. & Ref., pf.	105
Am.Sm.Sec., pf., A	92
Am. Zinc	11¼
Am. Zinc, pf	40
Anaconda	59⅜
Batopilas Min	1
Bethlehem Steel	62½
Butte & Superior	18⅜
Butte Cop. & Zinc	5⅞
Cerro de Pasco	31⅝
Chile Cop.	18
Chino	33½
Colo. Fuel & Iron	38½
Crucible Steel	59
Crucible Steel, pf.	90½
Dome Mines	13
Federal M. & S.	10
Federal M. & S., pf.	36½
Great Nor., ore ctf.	39½
Greene Cananea	42⅛
Gulf States Steel	56½
Homestake	98
Inspiration Con.	44½
International Nickel	25⅜
Kennecott	29⅛
Lackawanna Steel	66⅛
Mexican Petrol.	178⅛
Miami Copper	22⅜
Nat'l Lead, com.	66⅛
National Lead, pf.	108⅛
Nev. Consol.	16
Ontario Min.	7⅛
Ray Con.	19⅛
Republic I.&S.,com.	75⅛
Republic I.&S., pf.	101
Sloss-Sheffield	50
Tennessee C. & C.	13
U. S. Steel, com.	93⅛
U. S. Steel, pf.	114⅜
Utah Copper	68
Va. Iron C. & C.	54

BOSTON CURB*	Feb. 24
Alaska Mines Corp.	‡.12
Boston Ely	.95
Boston & Mont.	.43
Butte & Lon'n Dev.	.12
Calaveras	1
Chief Con.	3⅛
Contact	.05
Corbin	‡.25
Cortez	.13
Crown Reserve	.50
Crystal Cop.	.19
Eagle & Blue Bell	2⅛
First Nat. Cop.	1¼
Houghton Copper	.30
Intermountain	‡.05
Iron Blossom	.45
Iron Cap	13⅛
Majestic	.20
Mexican Metals	.26
Mines of America	.05
Mojave Tungsten	.04
Nat. Zinc & Lead	.08
Nevada-Douglas	.20
New Baltic	1
Oneco	.20
Pacific Mines	‡.35
Rex Cons.	.05
Yukon Gold	.75

SAN FRAN.*	Feb. 4
Alta	.02
Andes	.03
Best & Belcher	.02
Caledonia	.03
Challenge Con.	‡.03
Confidence	.04
Con. Virginia	‡.05
Gould & Curry	.02
Hale & Norcross	.11
Jacket-Cr. Pt.	.03
Mexican	.08
Occidental	.40
Ophir	.09
Overman	.01
Savage	.07
Sierra Nevada	.03
Union Con.	.08
Utah Con.	‡.01
Belmont	3.50
Jim Butler	.39
MacNamara	.25
Midway	.27
Mont.-Tonopah	.15
North Star	.08
Rescue Eula	.09
West End Con.	1.20
Atlanta	.04
Booth	.13
Comb. Frac.	‡.02
Florence	.12
Jumbo Extension	.12
Kewanas	.04
Nevada Hills	.03
Nevada Packard	.25
Round Mountain	.32
Silver Pick	.04
White Caps	.16

COLO. SPRINGS*	Feb. 4
Cresson Con.	4.87½
Doctor Jack Pot	.04
Elkton Con.	.04
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.74
Granite	.11
Isabella	.05½
Mary McKinney	.07
Portland	1.00
United Gold M.	.14½
Vindicator	.44

BOSTON EXCH.†	Feb. 25
Adventure	‡.60
Ahmeek	69½
Algomah	‡.30
Alloues	‡43
Ariz. Com.	11½
Arnold	‡.20
Bingham Mines	‡8½
Bonanza	‡.10
Butte-Balaklava	‡.22
Calumet & Ariz.	57½
Calumet & Hecla	420
Centennial	‡13½
Copper Range	40½
Daly West	‡5
Davis-Daly	‡5
East Butte	9
Franklin	‡3½
Granby	‡79
Hancock	5½
Hedley	‡12
Helvetia	‡.20
Indiana	‡.75
Isle Royale	25½
Keweenaw	‡1½
Lake	‡3
La Salle	2
Mason Valley	‡2½
Mass.	‡4½
Mayflower	‡3½
Michigan	2
Mohawk	51½
New Arcadian	1
New Cornelia	16
New Idria	‡8½
North Butte	9½
North Lake	.50
Ojibway	‡1½
Old Dominion	‡34
Osceola	48½
Quincy	56
St. Mary's M. L.	‡43
Santa Fe	‡.25
Seneca	‡14
Shannon	2
Shattuck-Ariz.	‡14½
So. Lake	‡1½
So. Utah	‡.14
Superior	5
Superior & Bost.	‡2½
Trinity	2½
Tuolumne	.86
U. S. Smelting	47
U. S. Smelting, pf.	47½
Utah Apex	2½
Utah Con.	8
Utah Metal	1½
Victoria	1
Winona	‡.90
Wolverine	17½

N. Y. CURB†	Feb. 25
Big Ledge	.68½
Butte & N. Y.	‡.50
Butte Detroit	‡.01½
Caledonia	.30
Calumet & Jerome	1/16
Can. Cop. Corpn	1 11/16
Carlisle	‡2
Cashboy	‡.06
Con. Ariz. Sm.	1
Con. Coppermines	4½
Goldfield Con.	.17
Goldfield Merger	.05½
Greenmonster	‡3/16
Hecla Min.	4
Howe Sound	‡3
Jerome Verde	‡.50
Louisiana	‡3/16
Magma	‡25
Marsh	.03
McKinley-Dar-Sa	.45
Milford	‡.75
Mother Lode	.32
Nixon Nevada	.40
Ohio Cop.	1/16
Rawley	‡2
Ray Hercules	2½
Richmond	‡.56
Rochester Mines	.27
St. Joseph Lead	‡11
Standard S. L.	1
Stewart	‡.16
Success	5
Tonopah	‡3
Tonopah Ex.	2
Tribullion	‡1
Troy Arizona	‡.10
United Eastern	4½
United Verde Ext.	‡30
United Zinc	‡1
Utica Mines	‡.08

TORONTO*	Feb. 25
Adanac	.18
Bailey	.04
Beaver Con.	.39
Chambers Ferland	.09
Coniagas	2.50
Hargraves	.03
Kerr Lake	‡5.37½
La Rose	.31½
Lake Shore	‡.90
Min. Corp. of Can.	2.00
Nipissing	‡8.75
Peterson Lake	.08
Temiskaming	.31
Wettlaufer-Lor.	.04
Davidson	‡.55
Dome Exten.	.26
Dome Lake	.20
Hollinger	6.12½
McIntyre	1.62½
Newray	.12½
Porcu. Crown	.28
Teck-Hughes	.25
Vipond	.20
West Dome	.15

* Bid prices. † Closing prices. ‡ Last quotations.